NATIONAL INSTITUTE FOR HEALTH AND WELFARE

Sari Castrén

Disordered Gambling in Finland: Epidemiology and a Current Treatment Option

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DISORDERED GAMBLING IN FINLAND: EPIDEMIOLOGY AND A CURRENT TREATMENT OPTION

ACADEMIC DISSERTATION

To be publicly discussed with the permission of the Faculty of Behavioural Sciences, University of Helsinki, in room/Auditorium 107, Siltavuorenpenger 3A on August 28th, 2013, at 12 noon.

National Institute for Health and Welfare
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To my wonderful children

Abstract

Sari Castrén. Disordered Gambling in Finland: epidemiology and current treatment option. National Institute for Health and Welfare (THL). Research 111. 126 pages. Helsinki, Finland 2013.
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Disordered gambling is a multifaceted phenomenon, and consequently many factors have a role in its development and maintenance. Adverse consequences of disordered gambling can be mental, social and legal. Only a few epidemiological studies of disordered gambling have previously been conducted in Finland, and none of these studies have been published internationally. Gambling research in Finland has increased during the past years, especially the investigation of treatment options for disordered gambling. In this thesis, disordered gambling is approached from two angles: the epidemiological angle provides an overall picture of the current situation in Finland, and the treatment angle studies the phenomenon from an individual standpoint.

In the epidemiological studies of this thesis, the prevalence, socio-demographic characteristics, comorbid substance use, perceived health and well-being and the type of gambling and its relations to the severity levels of gambling were measured. The data were derived from two samples, The Health Behaviour and Health among the Finnish Adult Population, Spring 2010, postal survey (N = 2826) and The Finnish Gambling 2011 (N = 3451), telephone interview. These studies used South Oaks Gambling Screen (SOGS) and Problem Gambling Severity Index as a measure of gambling severity. In the epidemiological studies the prevalence of disordered gambling was found to be about 3% (Finnish Gambling 2011). Disordered gambling was more common among males and the younger age group. Disordered gambling was generally associated with socio-economic disadvantages like being divorced, unemployed or having a low level of education. Comorbid alcohol use and nicotine dependency as well as low self-perceived mental health status were associated with disordered gambling. Lotto (Finnish lottery) was the most popular type of game gambled, but slot machine and internet gambling were found to be associated with disordered gambling.

The two treatment studies of this thesis describe the socio-demographic characteristics (N = 471), the severity of disordered gambling, gambling urge, gambling-related erroneous thoughts and the level of control of gambling among the treatment-seeking gamblers. In the treatment studies, comorbid alcohol use and depression were also studied. Moreover, changes in the severity of gambling, gambling urge, gambling-related erroneous thoughts and control of gambling, as well as alcohol use and the level of depression at baseline, post-treatment and 6- and 12-month follow-

up were studied. The data were derived from the Peli Poikki program which is an internet-based 8-week cognitive behavioural therapy for gamblers. This study used NORC DSM-IV Screen for Gambling Problems as a measure of gambling severity. Results revealed that 78.8% of the treatment-seeking participants were disordered gamblers. 224 participants completed the treatment and after 8 weeks of treatment a significant decline was seen in gambling-related problems and gambling urge, and an improvement in control of gambling. The mood of participants improved and alcohol use decreased during the treatment period, and participants reported improvements in their social situations after the treatment.

In conclusion, the prevalence of disordered gambling has been more or less unchanged during the past years in Finland. A specific socio-demographic group of individuals seems to be at higher risk of having and developing disordered gambling, especially with the abundant gambling opportunities in Finland. The results of the Peli Poikki program encourages implementing more evidence-based treatment options for disordered gambling in Finland.

Keywords: cognitive behavioural therapy, disordered gambling, epidemiology, prevalence, internet-based treatment, socio-demographic characteristics, type of gambling

Tiivistelmä

Sari Castrén. Disordered Gambling in Finland: epidemiology and a current treatment option [Rahapelaamishäiriö Suomessa: epidemiologia ja hoito]. Terveyden ja hyvinvoinninlaitos (THL).Tutkimus 111. 126 sivua. Helsinki, Finland 2013.
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Rahapelaamishäiriö on monisyinen ilmiö, jonka syntyyn ja jatkumoon liittyy useita osatekijöitä. Rahapelaamishäiriön seuraukset voivat olla terveydellisiä, sosiaalisia, taloudellisia tai oikeudellisia. Ennen vuotta 2013 vain muutama kansainvälinen julkaisu rahapelaamishäiriön epidemiologiasta Suomessa oli saatavilla. Viime vuosina rahapelaamishäiriön tutkiminen Suomessa on lisääntynyt ja samalla tuntemus rahapelaamishäiriön epidemiologiasta ja hoidosta kasvanut. Tämä väitöskirja käsittelee tuoreimpaan tutkimustietoon pohjautuen rahapelaamishäiriötä kahdesta näkökulmasta: väestötutkimus antaa kokonaiskuvan suomalaisten rahapelaamishäiriöstä ja hoitotutkimus valottaa ilmiötä yksilön näkökulmasta.

Tässä väitöskirjassa on tutkittu väestötutkimusaineistoihin pohjautuen rahapelaamishäiriön esiintyvyyttä suomalaisessa väestössä sekä sosiodemograafisten taustatekijöiden, koetun terveyden ja hyvinvoinnin, rahapelaamisen tyypin ja liitännäisongelmien (kuten alkoholin riskikulutus ja tupakointi) yhteyttä rahapelikäyttäytymiseen ja rahapelaamishäiriön vaikeusasteeseen. Väitöskirjaan sisällytetyt väestötutkimuksen alaan kuuluvat osajulkaisut ovat I) postikyselytutkimus ”Suomalaisen aikuisväestön terveyskäyttäytyminen ja terveys, kevät 2010”, (N = 2826) sekä II) puhelinkyselynä toteutettu ”Suomalaisten rahapelaaminen 2011”, (N = 3451). Rahapelaamishäiriön vakavuutta mitattiin väestötutkimuksissa kahdella eri mittarilla: South Oaks Gambling Screen (SOGS) ja Problem Gambling Severity Index (PGSI). Suomalaisten rahapelaaminen 2011 – tutkimuksen mukaan rahapelaamishäiriön esiintyvyys väestötasolla oli noin 3 %. Rahapelaamishäiriö oli yleisempää miehillä ja nuoremmissa ikäluokissa kuin naisilla tai vanhemmissa ikäluokissa. Tutkimustulosten mukaan rahapelaamishäiriön esiintyvyys oli yhteydessä sosiaalisiin taustatekijöihin kuten avioeroon, työttömyyteen ja alempaan koulutustasoon. Samanaikainen alkoholin käyttö, tupakointi sekä mielenterveysongelmat olivat yhteydessä rahapelaamishäiriön vaikeusasteeseen. Lotto oli pelatuin rahapeli väestöotoksessa, rahapeliautomaattien ja internetin välityksellä pelatut rahapelit olivat kuitenkin voimakkaimmin yhteydessä rahapelaamishäiriön vaikeusasteeseen.

Tässä väitöskirjassa on tutkittu hoitotutkimukseen pohjautuen hoitoon hakeutuneiden rahapelaamishäiriöstä kärsivien rahapelaajien (N = 471) sosiodemograafisia taustatekijöitä, rahapelaamisen vaikeusastetta, rahapelihimoa, rahapelaamiseen liittyvien virheellisten uskomusten ja pelaamisen kontrollin astetta sekä liitännäisongelmia (masennus ja alkoholin riskikulutus) sekä muutoksia näissä muuttujissa

ennen hoitoa ja hoidon jälkeen sekä 6 ja 12 kuukauden jälkiseurannoilla. Aineistona tutkimuksessa käytettiin Peli poikki hoito-ohjelman (kognitiiviseen käyttäytymisterapiaan pohjautuva virtuaaliterapia) aikana kerättyjä tietoja. Väitöskirjaan on sisällytetyt hoitotutkimuksen alaan kuuluvat osajulkaisut ovat III ja IV. Hoitotutkimuksissa rahapelaamishäiriön vakavuutta mitattiin NORC DSM-IV Screen for Gambling Problems- mittarilla. 78.8% osallistujista täytti rahapelaamishäiriön kriteerit. 244 osallistujaa kävi loppuun 8-viikkoa kestäneen hoito-ohjelman. Hoito-ohjelman läpikäyneiden osallistujien rahapelaamisen vaikeusaste ja rahapelihimo laskivat, kun taas rahapelaamisen kontrolli kasvoi. Lisäksi osallistujien mieliala koheni ja alkoholin kulutus ja negatiiviset rahapelaamisen aiheuttamat seurannaisvakutukset vähenivät.

Väitöskirjan osatöiden perusteella voidaan sanoa, että suomalaisten rahapelaaminen on pysynyt jokseenkin samalla tasolla 2000-luvulla. Tietyt sosiaaliset taustatekijät ovat selkeästi yhteydessä rahapelaamishäiriön vaikeusasteeseen ja kehittymiseen. Peli poikki hoito-ohjelman tulosten perusteella tutkittuun tietoon perustuvan hoito-ohjelman vaikuttavuus on lupaavaa, joten tutkittuun tietoon perustuvia hoito-ohjelmia ja malleja tulisi käyttää rahapelaamishäiriön hoidossa Suomessa laajemminkin.

Avainsanat: esiintyvyys, internet-pohjainen hoito, kognitiivinen käyttäytymisterapia, pelityyppi, rahapelaamishäiriö, sosiaaliset taustatekijät, väestötutkimus

Sammanfattning

Sari Castrén. Disordered Gambling in Finland: epidemiology and a current treatment option. [Spelberoende i Finland: epidemiologi och behandling]. Institutet för hälsa och välfärd (THL). Forskning 111, 126 sidor.
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Spelberoende är ett komplicerat fenomen, och det finns olika faktorer som bidrar till dess uppkomst och förlopp. Spelberoende kan leda till hälsomässiga, sociala, ekonomiska eller juridiska konsekvenser. Före 2013 fanns det bara några internationella publikationer om epidemiologin för spelberoende i Finland. Under de senaste åren har forskningen om spelberoende i Finland ökat, och samtidigt har kunskaperna om behandlingen av och epidemiologin för spelberoende ökat. Denna doktorsavhandling bygger på senaste forskningsrön och behandlar spelberoende ur två olika synvinklar: befolkningsstudien ger en helhetsbild av finländarnas spelberoende, och behandlingsstudien belyser fenomenet ur individens perspektiv.

Baserad på materialet från befolkningsstudien undersöker denna doktorsavhandling förekomsten av spelberoende i den finländska befolkningen. Dessutom undersöks hur sociodemografiska bakgrundsfaktorer, upplevd hälsa och välfärd, speltyp och problem som förknippas med spelande (till exempel rökning och riskkonsumtion av alkohol) står i samband med spelbeteendet och graden av spelberoende. De delarbeten som ingår i doktorsavhandlingen inom området befolkningsstudier är I) postenkäten ”Den finländska vuxenbefolkningens hälsobeteende och hälsa, våren 2010” (N = 2 826) samt II) ”Finländarnas penningspel 2011”, som genomfördes i form av telefonintervjuer (N = 3 451). Graden av spelberoende mättes i befolkningsstudierna med två olika instrument: South Oaks Gambling Screen (SOGS) och Problem Gambling Severity Index (PGSI). Enligt enkäten ”Finländarnas penningspel 2011” var förekomsten av spelberoende i befolkningen cirka tre procent. Spelberoende var vanligare bland män och i yngre åldersgrupper än bland kvinnor och i äldre åldersgrupper. Enligt forskningsresultaten var förekomsten av spelberoende förknippad med sociala bakgrundsfaktorer, såsom skilsmässa, arbetslöshet och lägre utbildningsnivå. Psykisk hälsa, rökning och samtidig användning av alkohol hade ett samband med graden av spelberoende. Enligt urvalet var Lotto det populäraste spelet om pengar, men spelautomater och spel om pengar via Internet uppvisade starkast samband med graden av spelberoende.

Baserad på behandlingsstudien undersöker denna doktorsavhandling olika faktorer hos spelberoende personer som sökt behandling (N = 471). Dessa variabler är sociodemografiska bakgrundsfaktorer, grad av spelberoende, spelbegär, felaktiga uppfattningar om spelande om pengar, kontroll över spelande samt problem som

förknippas med spelande (depression och riskkonsumtion av alkohol). Dessutom undersöks förändringar i dessa variabler före och efter behandlingen och vid uppföljningarna efter sex och tolv månader. Som material i studien användes data som samlats in under behandlingsprogrammet ”Peli poikki” (virtuell terapi som bygger på kognitiv beteendeterapi). De delarbeten som ingår i doktorsavhandlingen inom området behandlingsstudier är III och IV. I behandlingsstudierna mättes graden av spelberoende med instrumentet NORC DSM-IV Screen for Gambling Problems. Kriterierna för spelberoende uppfylldes av 78,8 procent av deltagarna. 244 deltagare slutförde det åtta veckor långa behandlingsprogrammet. Graden av spelberoende och spelbegäret minskade och kontrollen över spelandet ökade hos deltagarna som slutförde behandlingsprogrammet. Dessutom förbättrades deltagarnas humör, och alkoholkonsumtionen och spelandets negativa effekter minskade.

På grundval av delarbetena kan man konstatera att finländarnas spelande om pengar har legat på ungefär samma nivå under 2000-talet. Vissa sociala bakgrundsfaktorer har ett klart samband med graden och uppkomsten av spelberoende. På grundval av resultaten från behandlingsprogrammet ”Peli poikki” är effekten av behandlingsprogrammet som bygger på evidensbaserad kunskap lovande. Därför borde behandlingsprogram och modeller som bygger på evidensbaserad kunskap användas i större utsträckning vid behandling av spelberoende i Finland.

Nyckelord: förekomst, webbaserad behandling, kognitiv beteendeterapi, speltyp, spelberoende, sociala bakgrundsfaktorer, befolkningsstudie

Contents

List of original papers

I Castrén, S., Basnet, S., Pankakoski, M., Ronkainen, J-E., Helakorpi, S., Uutela, A., Alho, H., Lahti, T. An analysis of Problem Gambling among the Finnish working-age population: A Population Survey. BMC Public Health 2013; 13:519 doi: 10.1186/1471-2458-13-519.

II Castrén S., Basnet, S., Pankakoski, M., Salonen, A, Ronkainen, J-E., Alho, H., Lahti, T. Factors associated with disordered gambling in Finland. Substance Abuse Treatment, Prevention, and Policy 2013; 8:24 doi: 10.1186/1747-597X-8-24.

III Castrén, S., Pankakoski, M., Ladouceur, R., Lahti, T. Internet-based 8-week cognitive therapy for gambling problems: socio-demographic characteristics of the participants. Psychiatria Fennica 2012; 43:79-96.

IV Castrén, S., Pankakoski, M., Tamminen, M., Lipsanen, J., Ladouceur, R., Lahti, T. Internet-based CBT intervention for gamblers in Finland: Experiences from the field. Scandinavian Journal of Psychology 2013; 54(3): 230-235 doi: 10.111/sjop.12034.

In the text these articles will be referred to as Studies I-IV.

Abbreviations

ANOVA	Analysis of variance
AVTK	Health Behaviour and Health among the Finnish AdultPopulation
AUDIT-C	Alcohol Use Disorders Identification Test
B	Estimates
CBT	Cognitive Behavioural Therapy
CI	Confidence Interval
DG	Disordered Gambling
DSM-III-R	Diagnostic and Statistical Manual of Mental Disorders, Third Edition-Revised
DSM-IV	Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition
DSM-5	Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition
EBT	Evidence-based treatment
EFPPA	European Federation of Professional Psychologists' Associations
EGM	Electronic Gaming Machines
GD	Gambling Disorder
GEE	Generalized Estimating Equations
MADRS-S	Montgomery Åsberg Depression Rating Scale, Self-administrated version
M	Means
MHI-5	Mental Health Inventory
MI	Motivational Interviewing
NODS	NORC DSM-IV Screen for Gambling Problems
NRC	National Research Council
OR	Odds ratios
PAF	Åland Slot Machine Association
PG	Pathological gambling
PGs	Pathological gamblers
PGSI	Problem Gambling Severity Index
PGRTC	Problem Gambling Research and Treatment Centre
PP program	Peli Poikki program
SD	Standard Deviation
SOGS	South Oaks Gambling Screen
SOGS-R	South Oaks Gambling Screen Revised

1 Introduction

Gambling has attracted mankind since the beginning of our civilisation. Notes and quotes of gambling have been traced, for example, from the writings of Homer, Chaucer and Shakespeare. Even more recent writing of Fyodor Dostoyevsky "The Gambler" captures well the spell of gambling:

"I believed in my system... went to the tables, and within a quarter of an hour I won 600 francs. This whetted my appetite. Suddenly I started to lose, could not control myself and lost everything... In Baden I took my last money, and went to play. Starting with 4 napoléons I won 35 napoléons in half an hour. I was carried away by this unusual good fortune and risked all 35 napoléons and lost them all. I had 6 napoléons left to pay landlady and for the journey. In Geneva I pawned my watch." (Dostoevsky, The Gambler).

Ancient and recent quotes and notes of gambling reflect lust, excitement and joy, but on the other hand also loss, despair and misery. In fact, there is a vast truth in those quotes in describing well what gambling is about, problematic gambling in particular: a moment's pleasure, yet rarely a lifetime treasure. Today, the increasing amount of opportunities to gamble and the constant expansion of the gambling markets have the potential to increase disordered gambling (Williams et al., 2012).

Gambling is widely available in Finland (Jaakkola, Murto & Pajula, 2012), and in the future gambling opportunities for the Finns will grow even more with a new casino opening in the eastern part of Finland. As expansion of legal gambling opportunities, especially slot machines and casino gambling, has the tendency to increase disordered gambling in societies (Williams et al., 2012; Cox et al., 2005), disordered gambling has become a public health concern in Finland.

In this thesis, disordered gambling was studied from two angles: epidemiology and treatment. Epidemiological studies investigated phenomena associated with disordered gambling (Shaffer et al., 2004; Petry, 2005; Black et al., 2012). Treatment studies investigated the treatment-seeking population of disordered gamblers and the efficacy of an internet-based cognitive behavioural therapy. The first aim of these studies was to identify the factors related to the development of disordered gambling: by identifying these factors, early detection and prevention of disordered gambling is possible. The second aim of these studies was to evaluate how the only evidence-based treatment (EBT) option available in Finland works in practice.

2 Review of the literature

2.1 Terminology

As based on individual gambling patterns, varying terms can be used for classification of disordered gambling (DG). Terms "pathological gambling", "problem gambling", "compulsive gambling", "gambling addiction", "at-risk gambling", "low-risk gambling" and "probable pathological gambling" are often used in gambling research. The different terms stem from various instruments that have been used to measure the severity of disordered gambling.

Shaffer and colleagues (1997) defined disordered gambling as a term to describe the full range of gambling problems. The severity of disordered gambling range from at-risk gambling to problem gambling and to pathological gambling (PG) (NRC, 1999). Similar to other addictive behaviours (e.g., psychoactive substance use), disordered gambling may eventually lead to: a) neuro-adaptation with increase of tolerance and experience of withdrawal symptoms and b) negative psychosocial consequences such as debt, shame, guilt and depression (Shaffer et al., 2004). Those disordered gamblers who continue to gamble even with adverse consequences, may lose control over gambling and eventually become pathological gamblers (PGs) (Shaffer & Martin, 2011). Note that at least five of the ten criteria of the DSM-IV must be met for a diagnosis of pathological gambling (Table 1) and three of the ten criteria for problem gambling.

In May 2013, specific changes took place in DSM criteria. Due to the similarities between substance and behavioural addictions in natural history, phenomenology and adverse consequences (Grant et al., 2010; Holden, 2010), diagnosis of pathological gambling has been reclassified in DSM-5 (APA, 2013) as "Substance-Related and Addictive Disorders". The term "pathological gambling" has been renamed Gambling Disorder (GD). Changes in diagnostic criteria are as follows: a) elimination of the criterion "has committed illegal acts such as forgery, fraud, theft, or embezzlement to finance gambling", b) lowering the threshold for diagnosis meaning that four or more of nine points are needed for the diagnosis, c) adding a specific timeline that is needed for a diagnosis, meaning that gambling must occur within a 12-month period in order to meet the criteria of GD, d) three levels of severity: mild (4-5 criteria met), moderate (6-7 criteria met) and severe (8-9 criteria met), e) course of the disorder either episodic or persistent, f) recovery status: either in early remission or in sustained remission (APA, 2013).

This thesis, however, used measures based on the previous DSM-IV criteria.

Table 1. Diagnostic Criteria for Pathological Gambling, Reworded From the Diagnostic and Statistical Manual of Mental Disorders IV

1.	Preoccupation. Frequent thoughts about gambling.
2.	Tolerance. Need to gamble with larger amount of money.
3.	Withdrawal. Repeated unsuccessful efforts to cut down or stop gambling.
4.	Restless or irritable when attempting to reduce gambling.
5.	Escape. Gambling to escape problems or relieve negative mood.
6.	Chasing lost money by returning to gambling to get even.
7.	Lying to others to hide extent of gambling.
8.	Illegal acts to support gambling.
9.	Jeopardizing important relationships and job opportunities because of gambling.
10.	Bailing out. Relying on others to relieve financial problems caused by gambling.

Note: From Diagnostic and Statistical Manual of Mental Disorders (4th ed., p.615), 1994, Washington DC; American Psychiatric Association. Copyright by the American Psychiatric Association. Adapted and printed with permission.

In this thesis several instruments were used to measure the severity of disordered gambling: SOGS (South Oaks Gambling Screen), NODS (NORC DSM-IV Screen for Gambling Problems) and PGSI (Problem Gambling Severity Index). All these above mentioned instruments use their unique cut-off points to define the level of severity of disordered gambling. Despite the differences in their cut-off points and terms used in these instruments, this thesis uses the term disordered gambling systematically throughout the text as defined by Shaffer and colleagues (1997).

2.2 Fundamental principles of disordered gambling

2.2.1 Impaired control of gambling

Impaired control to restrain oneself from certain behaviour is a common feature of addictions (Alcoholic Anonymous, 1939; Jellinek, 1960; Heather, 1991; Corless & Dickerson, 1989; Dickerson et al., 1991; Dickerson & Baron, 2000). In 1991 Dickerson and colleagues pointed out that regular gamblers have difficulties in maintaining control over gambling (i.e., money and time consumed to gamble) during their gambling sessions. Impaired control to restrain oneself from gambling urges has nowadays been recognized as one of the most important underlying factors behind the development of disordered gambling (Blaszczynski & Nower, 2002; Dickerson, 2003).

According to Cantinotti and colleagues (2009) pathological gamblers (PGs) gamble with the intention to refund their debts and to escape from stress. PGs' erroneous thoughts include the idea of recouping losses by gambling and are fuelled by positive expectations, which further increases gambling behaviour.

2.2.2 Cognitive basis of gambling and illusion of control

Disordered gambling includes specific thought patterns that fuels the idea of winning or even predicts the wins. These thought patterns are modified by gambling-related erroneous thoughts and include the following errors in thinking: gamblers' limited knowledge of negative winning expectancy, independence of turns or events, illusion of control, superstitions and the fallacious hope of recouping losses (Ladouceur et al., 2002).

Negative winning expectancy is based on interpretative error, which makes gamblers believe that they have better chances to win by gambling. The fact is that the gambling industry is a profit-seeking business and thus cannot be profitable for the gamblers. In other words, all games with negative winning expectancy are profitable for the industry. The more gamblers bet, and the more their bets increase, the more their chances of losing increases.

The independence of events is often misinterpreted among gamblers. Independence of events refers to an event not influenced by previous or following events. It is independent by itself. Gamblers' misinterpretation of events occurs when two events having nothing to do with each other are erroneously linked together. For example, in slot machine gambling, a gambler's speed or way of touching the buttons of the machine is not actually linked to winning. However, in the gambler's mind the way of operating a machine are linked with wins. This in turn fosters the gambler's illusion of control and leads them to continue gambling. How is such a misinterpretation possible? First, the principle of independence of events occurs in all games of chance. Second, games of chance are based on chance, meaning that one wins or loses by chance. Third, games of chance are structured in such a way that each event is independent and cannot be predicted. With all this in mind, it is impossible to predict, control or influence the outcome of a game of chance.

Another trap for gamblers is the illusion of control, meaning that he or she could somehow influence the outcome of the game. Langer (1975) defined the illusion of control as an expectancy of success higher than the objective probability would warrant. There are specific illusions related to different game types. Table 2 shows some specific game illusions.

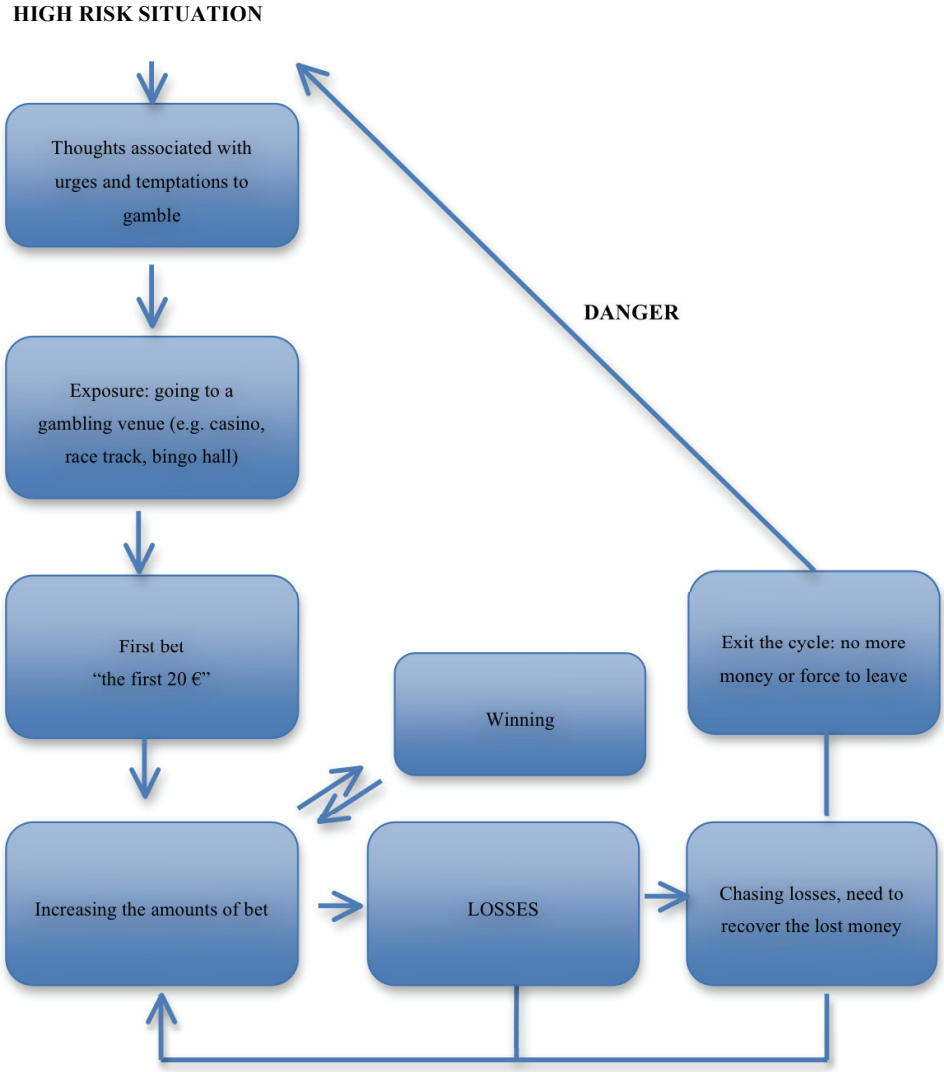
Table 2. Illusions of control in different games

Game	Illusion
Slot machine	Observing the machine's cycles or patterns of winning or losing Pressing the start button in different ways, e.g. changing your level of force, hitting it repeatedly, or changing your speed of betting
Lottery	Keeping track of winning numbers from previous draws Betting on lucky numbers
Bingo	Choosing cards that have favourite numbers in them Choosing a table where several people have won recently
Blackjack	Trying to memorize or count cards Placing very high bets
Roulette	Watching previous rolls and keeping count of outcomes Observing croupier's rolling technique, e.g. rhythm, regularity, continuity
Horse race	Studying statistics from previous races Analysing the physical attributes of the horse, e.g. muscularity, way of standing.
Superstitions	"The 21st is a lucky day because it is made of three sevens" "When I am not trying to win I win"

Source: Ladouceur & Lachance, (2007). Adapted and printed with permission.

An individual's erroneous thoughts related to gambling fuels the urge to gamble. Thus the gambler becomes trapped into the circle of gambling, where both wins and losses lead to more gambling. Figure 1 shows the problem gambling behavioural chain by Ladouceur and Lachance (2007).

Figure 1. Problem Gambling Behavioural Chain



Source: Ladouceur & Lachance, (2007). Used with permission.

Ladouceur and Lachance (2007) have proposed what actually happens in a gambling situation on cognitive and behavioural levels. According to their model, strong urges are activated in specific high-risk situations. On a cognitive level this activation of urges means thoughts that lead to gambling. These gambling-related thoughts fuel the urge to gamble even more and thus maintain gambling. With the urge fuelled with gambling-related thoughts the gambler is vulnerable to be exposed to a gambling venue: in the case the gambler has access to a gambling venue he or

she first starts gambling with a low bet. The gambler either wins or loses and, despite "luck" he or she continues to gamble by either trying to increase the wins or to chase the losses, until the evident fact of having no money left.

2.3 Prevalence

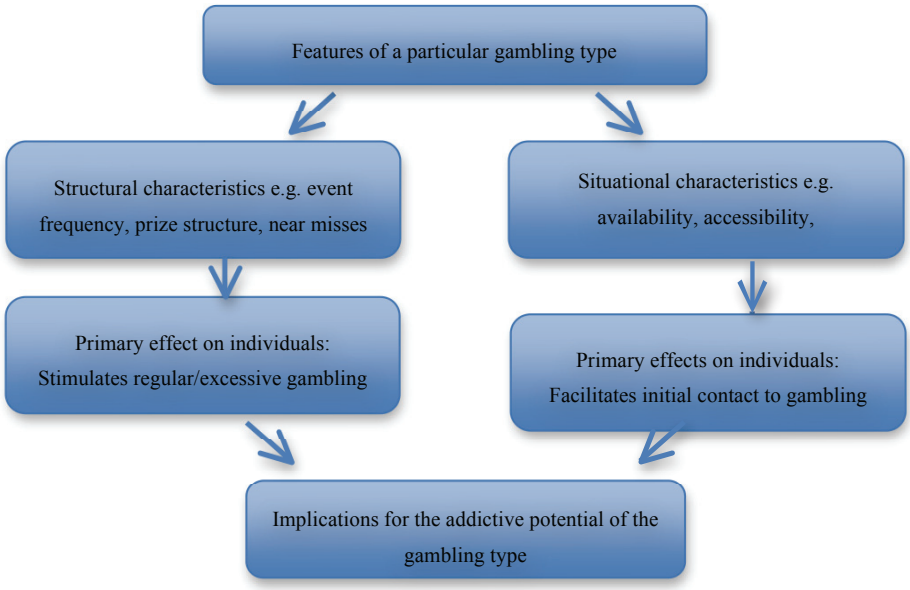
All in all, disordered gambling is an international phenomenon. Recent analysis by Williams, Volberg and Stevens (2012), that included a total of 202 prevalence studies between 1975 and 2012 worldwide, concluded that the standardized past-year problem gambling ranged from 0.5% to 7.6% with the average rate across all countries being 2.3%. According to their comprehensive report, the lowest prevalence rates are in Europe, intermediate rates in North America and Australia and the highest rates in Asia. The estimated current disordered gambling rate in Finland is 2.7%, more specifically 1.0% pathological gamblers and 1.7% problem gamblers (Turja et al., 2012).

2.4 Types of gambling and availability

The types of games gambled and especially specific features of them may have influence on the development of disordered gambling (Griffiths, 1999). For example, high frequency games that involve skill or perceived skill by creating a "near miss" illusion of having almost won are strongly associated with disordered gambling. Probability of winning or perceived probability of winning, and possibility of using credit to play are also associated with higher levels of disordered gambling (Parke & Griffiths, 2007). Electronic gaming machines (EGM's) and casino table games usually meet these criteria. In order to determine the addictive potential of a specific game type, both situational and structural characteristics should be taken into account.

Griffths, Hayer and Meyer (2009) illustrate type of gambling with an analysis scheme (Figure 2) by using situational and structural characteristics to explain the complexity of disordered gambling. In this scheme, the situational characteristics are the location of the gambling venues, the number of the gambling venues in a specific area, or advertisements that stimulate people to gamble and thus encompass the dimensions such as availability, acceptability and accessibility of gambling. Whereas structural characteristics are the gambler's motivation and urge to gamble in order to satisfy the need to gamble and, as a result, have the potential to induce regular or even excessive types of gambling.

Figure 2. The addictive potential of a particular gambling type – an analysis scheme



Source: Adapted From Problem Gambling in Europe, Challenges, Prevention and Interventions, Meyer, Hayer, & Griffths Eds. (p. xxi), 2009, New York, New York: Springer. Copyright by the Springer. Used with permission.

Globally, the utmost problems caused by disordered gambling are associated with EGM's (Griffths, 1999; Parke & Griffiths, 2006). EGM's account for some 70% of revenue for the gambling industry (Meyer, Hayer & Griffths, 2009). In Finland there are unique opportunities to gamble with about 20,000 EGM's scattered around kiosks, restaurants, shopping malls, grocery stores and fuel stations. Finnish Gambling Clinics' annual reports as well as Finnish Gambling Help Line – Peluuri's annual reports (Pajula et al., 2010; Pajula et al., 2011; Jaakkola et al., 2012) both show slot machines to be the most troubling game type for those who seek help. Notwithstanding the rather high problem of gambling rates in Finland, Finland's Slot Machine Association (RAY) is building a new casino in the eastern part of Finland to be opened in 2015. The opening of the new casino brings business to Finland, but also increases the potential to gamble, and thus may increase the risk of disordered gambling for the population living in close proximity of the gambling venue (Sevigny et al., 2008; Jacques, Ladouceur & Ferland, 2000). New gambling opportunities have the potential to attract people who have an existing gambling problem to relocate to areas that provide gambling opportunities, and may even encourage the gambling industry to build supplementary gambling venues in areas where a high rate of gambling already exists within the population (Shaffer and Korn, 2002).

2.5 Assessment

Various instruments have been developed and used for assessing gambling behaviours. Such instruments are, for example, the Problem Gambling Severity Index (PGSI; Ferris & Wynne, 2001), the South Oaks Gambling Screen Revised (SOGS-R; Lesieur & Blume, 1987) and the NORC DSM-IV Screen for Gambling Problems (NODS; Gerstein et al., 1999).

2.5.1 Problem Gambling Severity Index (PGSI)

The PGSI is a subset of the larger scale Canadian Problem Gambling Index (CPGI) (Ferris & Wynne, 2001). PGSI is based on DSM-IV criteria. PGSI has good psychometric properties. PGSI is simpler than SOGS/SOGS-R and DSM-IV yet has comparable internal consistency. Based on studies comparing PGSI with other measures like SOGS-R and Victorian Gambling Screen (VGS), CPGI was considered as a better instrument for population studies (McMillen & Wenzel, 2006).

2.5.2 South Oaks Gambling Screen (SOGS)

The South Oaks Gambling Screen (SOGS) was developed by Lesieur and Blume (1987) originally to measure lifetime gambling. SOGS is based on DSM-III-R criteria. SOGS also has good consistency, reliability and concurrent validity. Despite its wide use in population studies as well as research studies, SOGS has been reported to produce false positives and therefore overestimate the number of pathological gamblers, especially when used in the general population (Ladouceur et al. 2000; Walker & Dickerson, 1996; Abbott & Volberg, 1992; Volberg & Banks, 1990). SOGS has been modified further to SOGS-R (Abbott & Volberg, 1991; 1992; 1996). Where SOGS measures the lifetime gambling, the SOGS-R measures both current (6 months) and lifetime gambling problem and probable pathological gambling. Abbott and Volberg added the word probable to distinguish that the score on a SOGS-R indicated only probable classification compared to clinical interview by a professional.

2.5.3 NORC DSM-IV Screen for Gambling Problems (NODS)

The NODS was developed by Gerstein and colleagues in 1998 as based on DSM-IV modified criteria for pathological gambling. NODS was developed to produce less false positive answers than SOGS (Gerstein et al., 1999). The NODS screen showed good internal consistency and validity (Gerstein et al., 1999). However, NODS has been found to produce false positives, meaning that NODS identifies the gambling problem and pathology to be more severe than it is in reality (Phillips, 2005; Murray, Ladouceur & Jaques, 2007).

2.6 Socio-demographics of disordered gamblers

Certain socio-demographic characteristics are associated with the development of disordered gambling. Explicitly, they are young age, male gender and lower socio-economic status. Marital status and ethnic minority status are also associated with disordered gambling (Petry, 2005).

2.6.1 Age

Age is evidently associated with disordered gambling. Early onset age is a risk factor for disordered gambling (Bondolfi et al., 2000; Vitaro et al., 2004). Several studies report that the rate of PG is higher among adolescents and college students compared to adults (Stinchfield & Winters, 1998; Shaffer et al., 1999; Ladouceur et al., 1999). Gupta and Dereversky (1998) found that those adolescents who are PGs have more often parent(s) who gamble or are involved with illegal activities when compared to other adolescents. Strong and Kahler (2007) have found that younger gamblers differ from older gamblers by their tendency to chase losses more.

Along with adolescents being at risk for developing disordered gambling the middle age groups (ages 30-64) have the highest risk of becoming PG's (Welte et al., 2002; Petry et al., 2005; Korn & Shaffer, 1999; Wiebe & Kostyk, 2000; McNelly & Burke, 2000). Furthermore, McCready and colleagues (2008) have found that the same socio-demographic characteristics and comorbidities are apparent among elderly gamblers as with other age groups. However, the elderly gamblers may have different reasons to gamble (McNelly and Burke 2000): the elderly individuals may attend gambling venues especially to seek social activities.

2.6.2 Gender

Studies worldwide have consistently reported an association between gender and disordered gambling. Male gender has continuously been linked as a risk factor for disordered gambling (Blanco et al., 2006).

Previously in 1999, Shaffer, Hall and VanderBilt reported the prevalence rates of disordered gambling by gender. According to 17 studies, males gambled more than females, particularly at more severe level. The same trend seems to be apparent on all continents. Another significant gender difference among disordered gamblers is that males, unlike females, tend to be young, single and living alone without children (Crisp et al., 2004). Furthermore, males tend to choose games that are strategic such as sport betting or card gambling. In fact, Blaszczynski and colleagues (1997) found that sensation seeking and impulsivity was significantly linked with males who were PGs. Vitaro and colleagues (1999) confirmed the same observation among frequently gambling adolescent males. While males are seeking challenge, females

are identified as "escape" gamblers (Davis, 2002; Blanco et al., 2006). Females seem to gamble mostly because of boredom, loneliness and isolation (Brown & Coventry, 1997; Trevorrow & Moore, 1998). Where males take risks in order to win big, females spend more time in gambling and wager less than males. Where males prefer sport betting and card games with bigger wagering, females prefer EGM's and bingo, which allow perhaps more gambling time as a function to forget daily problems. Males tend to have more significant gambling debts than females (Potenza et al., 2006).

Another distinctive gender difference is that males can gamble longer than females before their gambling develops as disordered (Potenza et al., 2006; Ibanez et al., 2003; Ladd & Petry, 2002; Tavares et al., 2001). In other words, disordered gambling develops among females faster than among males. This same observation has been made with alcohol dependence (Randall et al., 1999; Brady & Randal, 1999; Potenza et al., 2001). Nevertheless, comorbid alcohol dependency is more common among males and anxiety and depression are more common among females (Ibanez et al., 2001; Potenza et al., 2006; Desai & Potenza, 2008).

There is also a gender difference in the tendency to seek treatment for disordered gambling: females are more proactive to seek help for disordered gambling than males (Slutske, Blaszczynski & Martin, 2009).

2.6.3 Socio-economic status

Low socio-economic status, which here includes income, education and socio-demographic rankings, is associated with elevated rates of disordered gambling. In 1999, Shaffer and colleagues and the National Research Council (NRC) reported that a low level of education (high school or lower) is associated with disordered gambling, as is also low employment status (Johansson et al., 2009; Kessler et al., 2008; Welte et al., 2008; Blanco et al., 2006; Toneatto & Nguyen, 2007). Moreover, Volberg et al. (2001) found that in Sweden, individuals that received social welfare payments are an at-risk group. On the other hand, Petry (2005) notes that lower socio-economic status and ethnic minorities are often linked with mental health problems. Therefore, it is not quite clear which problem leads to another.

2.6.4 Ethnicity

Prevalence rates seem to vary by race and ethnicity. Welte and colleagues (2002) reported higher rates of disordered gambling among African Americans, Latinos and Asians. Further, Welte and colleagues (2004) found that gambling had increased among non-white ethnic minority groups. Petry and colleagues (2005) reported that especially African Americans in America seem to be at greater risk for disordered gambling. Furthermore, Cunningham-Williams and colleagues (2007) found that African Americans differed from Caucasians by endorsing higher proportions of preoccupation,

chasing losses, loss of control, financial bailout, interference with life responsibilities and illegal behaviours. In Sweden, Lund (2007) study found that individuals that were born in a non-western country were at risk of developing disordered gambling.

2.6.5 Marital status

Being single, i.e., never married, separated or divorced, is a risk factor for disordered gambling (Ferris et al., 1996; Lyk-Jensen, 2010; Lund, 2007). A recent study by Black and colleagues (2012) concluded that PGs are more likely than others to have an unstable marital life, be divorced or live alone.

2.7 Comorbidity of disordered gambling and other psychiatric disorders

Comorbidity is defined in Mosby's Medical Dictionary (2009) as two or more coexisting medical conditions or disease processes that are additional to an initial diagnosis. Each disorder can occur independently and the pattern can be identified as lifetime comorbidity or in a simultaneous pattern known as current comorbidity (Petry, 2005). Persons with disordered gambling often suffer from various comorbid disorders.

Comorbid substance abuse is an important correlate of disordered gambling (Smart & Ferris, 1996; Cunningham-Williams, Cottler, Compton & Spitznagel, 1998; Spunt, Dupont, Lesieur, Liberty & Hunt, 1998; Shaffer, Freed & Helea, 2002; el-Guebaly et al., 2006; Rush, Veldhizen & Adlaf, 2007). Nicotine dependence is also strongly associated with disordered gambling. Petry and colleagues (2005) state that approximately 60% of problem gamblers have nicotine dependence. Previously, Petry and Oncken (2002) reported that smoking is also associated with gambling severity and other psychiatric symptoms. It was also found that smokers craved gambling more and suffered lower self-perceived control of gambling than non-smokers (Petry & Oncken, 2002). Harper (2003) stated that smoking is a strong trance-inducing ritual associated with gambling. Recently, Odlaug and colleagues (2012a) concluded that cigarette smokers presented significantly more severe level of disordered gambling.

Comorbid psychiatric disorders that have been identified with disordered gambling are: major depression, dysthymia, manic disorders, generalized anxiety disorder, panic disorder, social and other phobias which are also identified as gambling comorbidities (Petry, 2005). Also attention deficit hyperactivity disorder, antisocial, narcissistic and borderline personality disorders, depression, cyclothymia and bipolar disorder (Odlaug et al., 2012b; Park et al., 2010), as well as compulsive shopping and compulsive sexual behaviour, are linked to disordered gambling (Kaush, 2003).

A high rate of comorbidities linked to disordered gambling is observed in population studies and the same trend occurs among help-seeking gamblers (Rash et al., 2011; Seguin et al., 2010; Kausch, 2003). It has been noted that disordered gambling and substance abuse are more severe when they co-occur as compared to those with only one of the disorders (Petry, 2000).

The comprehensive review and meta-analysis of population studies by Lorains and colleagues (2011) shows that disordered gamblers appear to have various comorbid disorders. Table 3 shows the prevalence of comorbid psychiatric disorders as presented by Lorains and colleagues (2011).

Table 3. Prevalence of comorbid mental health disorders in disordered gambling by Lorains et al. 2011 (Used with permission)

Study	AUD[1]	MD[2]	BD[3]	SUD[4]	IDAD[5]	ND[6]	AD[7]	GAD[8]	AMD[9]	ASPD[10]
Afifi et al. 2010			4.0%		1.6%					
Bondolfi et al. 2000	36.0%									
Bondolfi et al. 2000	13.5%									
Cunningham et al. 1998	44.5%	8.8 %	3.1%		39.9%	76.3%		7.7%		35.0%
Fiegelman et al. 1998				26.0%						
Gerstein et al. 1999	9.9%	29.1%	32.5%							
Kessler et al. 2008		38.6%	17.0%	76.3%		63.0%	60.3%		55.6%	
Marshall & Wynne, 2004	15.0%	24.0%								
Park et al. 2010	30.2%	11.6%	0.0%	69.8%		34.9%			11.6%	
Petry et al. 2005	73.2%	37.0%	22.8%		38.1%	60.4%	41.3%	11.2%	49.7%	23.3%
Welte et al. 2001	18.0%									

Note: 1: Alcohol Use Disorder, 2: Major Depression, 3: Bipolar Disorder-Manic Episodes, 4: Substance Use Disorder, 5: Illicit Drug Abuse/Dependence, 6: Nicotine Dependence, 7: Anxiety Disorders, 8: Generalized Anxiety Disorder, 9: Any Mood Disorder, 10: Antisocial Personality Disorder

Some studies have identified individuals with disordered gambling of having poorer general health as compared to individuals who do not gamble (Morasco, von Eigen & Petry, 2006; Morasco, Pietrzak et al., 2006).

2.8 Social consequences of gambling

At an individual level, the consequences of disordered gambling can be personal, financial and legal problems.

High rates of divorce, decreased productivity and absences from work are common among disordered gamblers (Black et al., 2012; Shaw et al., 2007; Volberg & Boles, 1995; Ladouceur & Walker, 1996). One of the consequences of disordered gambling is debt, which can easily lead to financial instability (Unwin, Davis & De Leeuw, 2000). Financial instability can be a stress that leads to further symptoms of anxiety and depression. Stressful events may cause a decline in cognitive functioning by impaired judgement, and, as stated by Blaszczynski, McConaghy and Frankova (1991), may lead to criminal activities as the individual tries to recover the losses caused by gambling. Illegal acts are rather common among disordered gamblers (Brown, Killian & Evans, 2005). In fact, it has been suggested that as many as a third of criminal offenders meet the criteria for disordered gambling (Williams, Royston & Hagen, 2005).

2.9 Evidence-based treatment options

Natural recovery or recovery without formal treatment can occur for some gamblers (Hodgins, Wynne & Makarchuk, 1999; Suurvali, Hodgins & Cunningham, 2010). In 2006, Slutske reported that a third of the participants with a diagnosis of PG had recovered without treatment, and in 2009, Slutske and Blaszczynski reported that 80% of PGs recovered without treatment.

Coping methods in natural recovery are 1) practical: engaging oneself with meaningful activities, and 2) behavioural: paying attention to conditioned cues to gamble, for example, by avoiding gambling venues or advertisements or news about betting odds (Hodgins & el-Quebaly, 2000; Cunningham, Hodgins & Toneatto, 2009).

Various treatment options have been applied to disordered gambling over the years. The Problem Gambling Research and Treatment Centre (PGRTC, 2011) in Australia and The Cochrane Review (Cowlishaw et al., 2012) have identical suggestions for treating disordered gambling.

2.9.1 Psycho-social treatments

Cognitive therapy models primarily emphasise the modification of gambling-related erroneous thoughts (Ladouceur et al., 2001). In addition, the overestimation of probabilities of winning, independence of events and memory biases are covered in the treatment (Toneatto, 1999; Ladouceur & Lachance, 2007).

Behavioural therapy models approach disordered gambling learned patterns by reinforcement based on a functional framework. This means that the treatment focus is in antecedents, behaviours and consequences. In therapy the focus is in modification of one or more elements of that functional construction. In detail, behavioural therapy uses strategies like reduction of avoidance, exposure to high-risk situations, challenge of gambling-related erroneous thoughts with the help of behavioural experiments and skills training.

Cognitive behavioural therapies use elements from cognitive and behavioural techniques. Cognitive erroneous thoughts are identified, corrected and restructured. Behavioural methods are used to reduce the arousal and excitement of disordered gambling. At present, evidence-based treatment studies confirm that behavioural, cognitive and cognitive behavioural therapy (CBT) are the most effective psychotherapeutic treatments for problem gambling (Ladouceur et al., 2001; Petry et al., 2006; Toneatto & Ladouceur, 2003; Sylvain, Ladouceur & Boisvert, 1997). These treatments are cost-effective and have lasting-term benefits. The CBT model is also flexible and can be modified to meet clients' individual needs. The meta-analysis of treatment efficacy by Pallesen and colleagues (2005) showed that a combination of cognitive and behavioural therapies is the most efficient treatment model for the treatment of disordered gambling.

Motivational interviewing (MI) focuses on exploring and resolving ambivalence, and centres on motivational processes within the individual to facilitate the change (Miller & Rollnick, 2002). MI is a client-centred approach, yet directive where the therapist is promoting client's capacity for change, by intensifying discrepancy between present situation and behaviour with goals of change (Rollnick & Gobat, 2010). Motivational Enhancement Therapy (MET) is a four-session manualised intervention, derived from MI.

Group therapy is recommended by PGRTC to be delivered, but the body of evidence provides only some support for group intervention as based on research (Ladouceur et al., 2003; Echeburua et al., 1996).

2.9.2 Internet-based treatment

Internet-based therapies are a relatively new, though little studied, treatment option. Research evidence shows that only a small number (< 10%) of gamblers pursue treatment for their disordered gambling (Productivity Commission, 2010; Slutske, 2006; Cunningham, 2005). Therefore, new treatment options have been sought for

disordered gambling. Internet-based therapy appears to be a progressive alternative to face-to-face treatments. Internet-based treatment offers numerous advantages like availability, convenience, accessibility, cost-effectiveness, anonymity and privacy. These factors are valuable for those who seek help for addictions, but may not have access or the potential of face-to-face treatments (Monaghan & Blaszczynski, 2009 a, b; Gainsbury & Blaszczynski, 2011 a, b). These factors of internet-based treatment have various benefits. Cunningham (2007) stated that internet-based treatment modality works well with individuals that have not been seeking treatment actively or have dropped out from previous treatments. This means an overall increase in treatment uptake as only a very low percentage of gamblers seek treatment. The reasons for low help-seeking rates can be guilt, shame or apprehension of change or even a denial of the problem. Therefore, seeking internet-based treatment is easier (DiClemente & Prochaska, 1982). Moreover, evidence shows that internet-based CBT is effective and works (Carlbring & Smit, 2008; Carlbring et al., 2012).

2.9.3 Psychopharmacology

Opioid receptor antagonists (naltrexone and nalmefene) have been found to reduce the intensity of urges to gamble, gambling thoughts and gambling behaviour (Pallesen et al., 2007; Kim, Grant, Adison & Shin, 2001; Grant et al., 2006; Grant et al., 2008; Grant et al., 2010). Other pharmacological agents such as N-acetylcysteine, fluvoxamine, paroxetine, sertraline, bupropion and olanzapine (Pallesen et al., 2007; Black et al., 2007; Fong et al., 2008; McElroy et al., 2008) have also been used in the treatment of disordered gambling (Grant, Kim & Odlaug, 2007). So far, there have been only few studies combining pharmacological and psychological treatment options (Lahti et al., 2012a, 2013).

3 Aims of the studies

The basic aims of the four studies described here were to investigate the prevalence and characteristics of disordered gambling in Finland, and to study the efficacy of internet-based cognitive behavioural therapy for gamblers.

3.1 Aims of the epidemiological Studies I and II

In Study I, the first aim was to study the prevalence of disordered gambling (problem gambling) in the adult sample in Finland and to describe socio-demographic characteristics such as gender, marital status and employment status among disordered gamblers. The second aim was to investigate how alcohol use and cigarette smoking were associated with disordered gambling. Thirdly, the type and frequency of gambling was explored.

In Study II, the first aim was to compare the socio-demographic characteristics of non-problem gamblers, problem gamblers and PGs. The second aim was to investigate associations between gambling-related factors among the subgroups of gamblers. Third to investigate the association between perceived health and well-being among the subgroups of gamblers. Fourth to analyze simultaneously socio-demographic-characteristics, gambling related factors and perceived health and well-being and the severity of DG.

3.2 Aims of the treatment Studies III and IV

In Study III, the first aim was to describe the socio-demographic characteristics and the severity of disordered gambling, gambling urge, gambling-related erroneous thoughts, social consequences and the level of control of gambling among treatment-seeking gamblers at the baseline. The second aim was to measure the level of alcohol consumption and the level of depression at the baseline. The third aim was to use these variables as predictors for disordered gambling.

In Study IV, the aim was to measure changes in the severity of disordered gambling, gambling urge, gambling-related erroneous thoughts , social consequences and control of gambling, as well as alcohol use and the level of depression at baseline, post-treatment and 6- and 12- month follow-up.

4 Material and methods

4.1 Samples of the epidemiological studies

4.1.1 Study I

During April to June 2010, a total of 2826 individuals (1243 males and 1583 females) replied to the survey. An annual postal survey, entitled Health Behaviour and Health among the Finnish Adult Population (AVTK), was sent to a random sample of Finnish adults (N = 5000) aged between 15 and 64. The sample was derived from the Finnish Population Register. The survey was mailed to the participants in April 2010. A total of three reminders were sent until June if the participants did not return the survey. Participants sent their replies by pre-paid mail. The primary purpose of the AVTK survey was to obtain information about current health-related behaviours of working-age Finns, and about long- and short-term changes in health-related behaviours among this population. The survey examined key aspects of health-related behaviours including: smoking, dietary habits, alcohol consumption and physical activity. Two sections of gambling-related questions were included in the survey.

4.1.2 Study II

This study is based on a cross-sectional nationwide telephone survey entitled the Finnish Gambling 2011 (Turja et al., 2012). The data were collected between 3rd October 2011 and 14th January 2012. Participants were selected from the Finnish Population Register by using a random sample of 15-74-year-old Finns. The sample size was 16,000, of whom 11,129 had a registered telephone number. Before the telephone interview, the participants received an introductory letter describing the purpose of the study. The participants, whose phone number was not in the Finnish Population Register, were sent a letter requesting their willingness to participate in the survey. Eventually a total of 4,484 participants completed the study. From that sample, participants with any past-year gambling involvement (N = 3,451) were drawn for this study. The sampling weights based on age, gender and residency of the Finnish population (Turja et al., 2012) were applied to all descriptive and inferential analysis.

4.2 Sample of the treatment Studies III and IV

471 participants (325 males and 146 females) enrolled in the Peli Poikki (PP) program from May 2007 to September 2011. The Peli Poikki program is offered via internet sites (www.voimapiiri.fi; www.pelihaitat.thl.fi; www.pelipoikki.fi) to individuals that seek help for disordered gambling. All individuals whose anonymous information was used

in this study gave their consent to the purpose of the study. There were no exclusion criteria. Upon registration to the program the participants also filled in the Montgomery Åsberg Depression Rating Scale self-assessment (MADRS-S; Montgomery & Åsberg, 1979). In the case of participants scoring 20 points or higher in MADRS-S, they were advised to consult a mental health professional for appropriate help.

4.3 Measures of the epidemiological Studies I and II

4.3.1 Study I

Descriptive measures were classified by the gender, age, years of education, employment status and marital status.

Gambling severity was assessed by using the Finnish translation of the Problem Gambling Severity Index (PGSI) (Ferris & Wynne, 1999) where the sum of 9 items was computed, maximum points being 27, using a 4-point Likert scale with 0 = never, to 3 = almost always. Cronbach's alpha was 0.79. The scoring of the PGSI is as follows: a) 0 = non-problem gambling, b) 1 or 2 = low level of problems with few or no identified negative consequences (here considered to be low level gambling), c) 3 to 7 = moderate level of problems leading to some negative consequences (here considered to be moderate level gambling) and d) 8 or more = problem gambling with negative consequences and a possible loss of control (here considered to be problem gambling).

Consumption of alcohol was measured by two questions. Two questions of alcohol use: a) overall alcohol consumption: "During the past 12 months, have you consumed any alcohol?" Yes/No answers, b) risk-level of alcohol consumption: "How often do you drink six or more units of alcohol?" (One unit: 1/3 litre beer or cider, 12 cl wine, 8 cl strong wine, 4 cl strong alcohol), with a 6-point Likert scale where 1 = daily, 2 = 2–3 times per week, 3 = once a week, 4 = 2–3 times per month, 5 = couple of times per year or less, 6 = 0 never. Risk-level of alcohol consumption is defined at least 6 units at least once a week. Only question b) was used in the analyses, being a more accurate variable.

Frequency of smoking was measured by the question: "Do you smoke at the moment (cigarettes, pipe or cigars)? Using a 3-point Likert scale where 1 = yes, daily, 2 = once in a while, 3 = not at all.

The type of gambling was assessed by presenting 10 main types of gambling. The participants were asked to choose on what type of gambling they gambled. Gambling types were: a) Lotto and Viking lotto, b) daily Keno-lotteries, c) slot machines, d) scratch cards, e) sports betting, f) horse race betting and g) internet poker via both PAF (Åland Slot Machine Association) and other international internet gambling sites.

Frequency of gambling was measured using a 5-point Likert scale: not at all, less than once a week, 1–2 days per week, 3–5 days per week, 6–7 days per week. For gender and in general comparisons, responses were classified into two classes with regards to the frequency of gambling: less than once a week, and at least once a week.

4.3.2 Study II

Descriptive measures were classified by the gender, age, years of education and marital status.

Severity of disordered gambling was measured by using the South Oaks Gambling Screen (SOGS) (Lesieur & Blume, 1987). It is composed of thirteen items with a total score of 20 points. The scoring of SOGS is as follows: 0-2 = non-problem gamblers, 3-4 = problem gamblers, ≥5 = probable pathological gamblers. The Cronbach alpha for the SOGS was 0.913.

Gambling-related variables (problem gambler close by, gambling frequency, gambling expenditure and the types of games gambled) consisted of the following four questions. Onset age of gambling: "When did you start gambling?" Significant others' involvement in gambling activities: "Do any of the significant others of yours have problems with gambling?" with seven options (father, mother, sibling, grandparent, spouse, child, a close friend), and three answering options (yes, no, do not know).

Wagering on gambling: "How much money did you spend in gambling during the past week?" with three categories (do not know, 1-5 Euros, 5 or more Euros).

Type of gambling: lotto, scratch cards, slot machines, casino gambling and internet gambling during the past 12 months.

Loneliness was measured by using a question: "Do you feel lonely?" with five options which were recoded into two categories (all the time/often and sometimes/rarely/never).

Frequency of smoking was evaluated by using a question: "Have you smoked during the past 12 months?" with a 3-point Likert scale (daily, randomly, not at all). Random smokers and non-smokers were grouped into one for the analysis.

Consumption of alcohol was measured by using the modified version of the Alcohol Use Disorders Identification Test (AUDIT-C). AUDIT-C is a 3-item screen, which is used to identify the persons who are hazardous drinkers or have active alcohol use disorders (including alcohol abuse or dependence). The AUDIT-C has (Bush et al., 1998) a 5-point Likert scale scoring: a = 0 point, b = 1 point, c = 2 points, d = 3 points and e = 4 points. In this study, the total scores of AUDIT-C were counted by summing up the points for each item, and cut-off points recommended by Seppä (2010) were used to define risky drinking among males (score ≥6) and females (score ≥5).

The mental health of the participants was assessed by using the Mental Health Inventory (MHI-5) (Veit & Ware, 1983) comprising the following five items: nervousness, melancholy, jollity, calmness and happiness. MHI-5 was measured by using a 6-point Likert scale scoring: 1 = all of the time, 2 = most of the time, 3 = a good bit of the time, 4 = some of the time, 5 = a little of the time, 6 = none of the time. The total scores of MHI-5 variables were calculated by summing up the score of each item and the sums (range 4-30) were scaled into 1-100. Cut-off score of 52 or less was used: lower scores indicate clinically significant mental health problems (Berwick et al., 1991).

General health was inquired by using a question: "How is your general health at present?" with five options (bad, somewhat bad, average, good or somewhat good) recorded into three categories.

4.4 Measures of the treatment Studies III and IV

4.4.1 Study III

Descriptive variables were classified by the gender, age, onset age of gambling, level of education and employment status.

The NORC DSM-IV Screen for Gambling Problems (NODS) (Gerstein, Hoffman, Larison et al., 1999) was used to measure the severity of gambling. It is composed of 17 items. The sum of items was computed with maximum points of 10. Severity of gambling is determined as follows: 0 points = no gambling problem, 1-2 points = risky gambling habits, 3-4 points = problem gambling and 5-10 points = pathological gambling. NODS scores of the past two months were used in the analysis, being more representative of the recent past as compared to the past year.

The urge to gamble was measured by using one question: "How strong is your gambling urge, when it is at its strongest?" with a 10-point Likert scale, where 1 = weak urge to gamble to 10 = strong urge to gamble.

In Study III, four questions on control of gambling were used. Questions were: "Have you sometimes felt like that you are in a trance while you gamble?" "Have you sometimes felt that you are like another person when you gamble?" "Have you sometimes lost control of time while you gamble?" "Have you sometimes experienced that you had difficulties to recall what had happened while you gambled? A 5-point Likert scale was used, where 1 = never to 5 = always.

In Study IV only one question on control of gambling was used: "Have you sometimes lost control of your time while you gamble?"

Consumption of alcohol was measured by using a modified version of the Alcohol Use Disorders Identification Test (AUDIT-C) (Bush et al., 1998). It consists of 3 items with a 5-point Likert scale from 0 to 4 points. Sum of scores were used. Cut-off points for risky drinking among males (score ≥6) and females (score ≥5) recommended by Seppä (2010).

Social consequences of gambling were measured by using 14 questions, with a 5-point Likert scale, where 1 = very negative consequences to 5 = very positive consequences.

Gambling-related erroneous thoughts were measured by 14 questions with yes or no answers.

The patient-administered version of MADRS-S (Montgomery & Åsberg, 1979) was used to assess the mood of participants. The MADRS-S includes 9 questions with a 6-point Likert scale. Sum of scores range from 0 to 50 without weights used. Severity of depression is determined as follows: 0 to 6 = symptom absent, 7 to 19 = mild depression, 30 to 34 = moderate level of depression and 35 to 60 = severe level of depression.

Nine different types of gambling were investigated: slot machine gambling by RAY (Finnish Slot Machine Association), betting games both at the counter and via internet gambling site of Veikkaus (Finnish National Betting Agency), horse race betting Fintoto (Finnish National Horse Race Betting Agency), internet poker via PAF (Åland Slot Machine Association) and internet gambling via other international websites, internet poker by RAY, other internet gambling, casino gambling and other internet games not involving money.

Four questions of wagering were asked: "How much money have you wagered gambling in one week over the past month, and past year?" "How much money have you wagered in each gambling session over the past month, and past year?"

4.4.2 Study IV

In Study IV, the same variables as in Study III were used to collect the data at the baseline, after 8 weeks of treatment and in 6-and 12-month follow-up.

In Study IV, four trained therapists delivered the treatment.

The applied PP program is an 8-week internet-based CBT program with weekly therapist calls. Participants' progression is based on weekly modules. Participants are encouraged to participate in an online discussion group. The contents of the eight modules are:

1) Psycho-education and enhancement of motivation.
2) Recognition of high-risk situations and triggers for gambling behaviour. Recognition of gambling-related cognitive erroneous thoughts. Exercise: how to manage economy.
3) Identification of gambling-related social consequences.
4-5) Recognition of gambling-related erroneous thoughts and their impact on gambling behaviour. Enhancement to work toward future goals by accepting the present situation and focusing on the future.
6-7) Identification of gambling-related erroneous thoughts in a high-risk situation with practical exercises.
8) Relapse prevention.

4.5 Ethics of the studies

All present studies received ethics clearance from the Ethics Committee of the National Institute for Health and Welfare, Helsinki, Finland.

4.6 Statistics

4.6.1 Statistics of the epidemiological Studies I and II

In Study I, gender differences in socio-demographic variables, frequency of gambling and PGSI were assessed using t-tests for continuous data and Chi- Square tests for categorical data. A multinomial regression model was created to explore the association between socio-demographic variables and the level of gambling severity (PGSI). Different severity levels of gambling were compared to the non-problem gambling group, which served as the reference category. The statistical program SPSS (version 18) was used for the analyses.

In Study II, all continuous variables are presented as means (M) and standard deviations (SD) and all categorical variables are presented as frequencies and percentages. Chi-Square tests were used to assess the associations between categorical variables. The effect size of the best predictors of severity levels of disordered gambling was defined by using a multinomial regression analysis. Results of the multinomial regression model are presented as odds ratios (OR) and their corresponding 95% confidence intervals (CI).

The analyses were carried out in two steps. First, chi-square test was used to assess the statistical significance (p) of the associations of the categorical factors and the subgroups of gamblers. The factors for these bivariate analyses were chosen based on strong evidence gained from the previous studies. All categorical factors are presented using frequencies and percentages.

Then, simultaneously analysed factors associated with the severity of DG were explored using a multivariate-adjusted multinomial regression analysis. Problem gamblers and PGs were compared with non-problem gamblers. Selected factors consisted of socio-demographic characteristics, gambling-related factors and perceived health and well-being were included in the final model simultaneously.

Socio-demographic characteristics (gender, age and education) used in the model carry strong theoretical evidence from past studies. To precisely optimise the model, two game types, which represent the most widespread accessibility and addictive potential, slot machine and internet gambling, were included into the model as gambling-related factors. Finally, loneliness, daily smoking, risky alcohol consumption and overall mental health (MHI-5) represented significant factors related to perceived health and well-being.

The best fitting model was chosen by exploring different combinations of factors and comparing different models using the coefficient of determination (R squared). Results of the multinomial regression model are presented as odds ratios (OR) and their corresponding 95% confidence intervals (CI). Goodness of fit was assessed using Nagelkerke's R2.

4.6.2 Statistics of the treatment Studies III and IV

In Study III, all continuous variables are presented as means (M) and standard deviations (SD) and all categorical variables are presented as frequencies and percentages. A linear regression model was used to investigate variables contributing to gambling-related problems (NODS).

In Study IV, gender differences in socio-demographic variables and gambling types were analysed using t-tests and Chi-Square tests. A regression model was used to study the changes in time. Logistic regression was used with dichotomized variables NODS, gambling urge and impaired control of gambling. Results are presented with odds ratios (OR) and their corresponding 95% confidence intervals (CI). Linear regression was used in analysing continuous variables. Results are presented with best estimates (B) and confidence intervals (CI). Generalized estimating equations (GEE) were used in the estimation.

5 Results

5.1 Findings of the epidemiological Studies I and II

The basic findings of Studies I and II were that young age, male gender, low socio-economic status (including education) and separated or divorced marital status were associated with disordered gambling. Slot machine gambling and internet gambling were strongly associated with disordered gambling. Comorbid disorders, especially depression and low self-perceived mental health status, loneliness, alcohol consumption and cigarette smoking were also associated with disordered gambling.

5.1.1 Results of Study I

5.1.1.1 Socio-demographic characteristics

There were more females (56%) than males in this sample. The age difference between females (M = 42.3, SD = 14.4) and males (M = 43.6, SD = 14.32) was small but statistically significant (t (2824) = 2.40, p = 0.017). However, because of the large sample size, these kind of small and trivial differences often appear to be significant.

As many as 60% of the respondents reporting the most severe forms of disordered gambling were separated or divorced ($\chi^2 = 24.1$, df = 9, $p < 0.005$). The severity of disordered gambling was also compared with marital status, with 67.3% of those respondents with no current presentation of disordered gambling being married or cohabiting. Single status respondents had the highest percentage in both the low (17.5%) and moderate levels (6.9%) of disordered gambling.

Females were significantly more educated than males in this sample ($\chi^2 = 52.94$, df = 1, $p < 0.001$). With regards to unemployment there were no significant differences between men and women ($\chi^2 = 0.87$, df = 1, $p < 0.5$).

5.1.1.2 Gambling measure

Of all the respondents, 1.1% were problem gamblers with negative consequences and a possible loss of control (8 or more points on the PGSI-scale), with 5.5% of the respondents experiencing moderate levels of disordered gambling. According to this study's results, males suffered from more severe forms of problem gambling than females. Specifically, gender differences in all three PGSI categories were significant as follows: for low level (males = 88.9%, females = 97%), for moderate level (males = 9.0%, females = 2.6%) and for problem gambling level (males = 2.1%, females = 0.3%) ($\chi^2 = 73.47$, df = 2, $p < 0.001$; see Table 4).

Table 4. Gender differences in severity level of gambling

Gender	PGSI level					Chi-Square Test
	No Problem	Low	Moderate	Problem Gambling	Total	
	N (%)	N (%)	N (%)	N (%)	N (%)	
Male	836 (68.6)	248 (20.3)	110 (9.0)	25 (2.1)	1219 (44,5)	$\chi 2 = 154.24$, df = 3, p < 0.001
Female	1329 (87.5)	145 (9.5)	40 (2.6)	5 (0.3)	1519 (55.5)	
Total	2165 (79.1)	393 (14.4)	150 (5.5)	30 (1.1)	2738 (100)	

5.1.1.3 Comorbid disorders

Risk-level of alcohol consumption was greater among males as compared to females ($\chi^2 = 138.15$, df = 1, p = 0.001). Gender differences in smoking were also significant, indicating that males smoked more than females ($\chi^2 = 24.20$, df = 1, p < 0.001).

5.1.1.4 Gambling types and activity

The most common form of gambling was lotto, gambled by 56.4% of the respondents. Other popular game types were scratch cards (25.9%) and slot machine gambling (23.8%). Scratch cards was the only game type that was more popular among females (27.3%) than males (24.0%), the difference being marginally significant ($\chi^2 = 3.8$, df = 1, p = 0.058). In comparison, males favoured game types such as sports betting (14.1% males, 1.5% females) ($\chi^2 = 163.7$, df = 1, p < 0.001), horse race betting (5.7% males, 1.7% females) ($\chi^2 = 32.4$, df = 1, p < 0.001) and internet poker (5.4% males, 0.5% females) ($\chi^2 = 61.5$, df = 1, p < 0.001).

Upon assessing people who reported some degree of gambling activity, differences in the frequency of gambling exist in the following game types: lotto ($\chi^2 = 21.5$, df = 1, p < 0.001), slot machines($\chi^2 = 11.3$, df = 1, p < 0.01), sports betting ($\chi^2 = 7.5$, df = 1, p < 0.01) and horse race betting ($\chi^2 = 5.0$, df = 1, p < 0.05).

5.1.1.5 Frequency of gambling and the severity level of gambling

Table 5 shows types of gambling and the frequency of each game type gambled, less than once a week and at least once a week, within different levels of PGSI. Only subjects who reported at least some amount of gambling are included in the results. Type of games gambled are presented from highest to lowest frequencies.

Table 5. Type of games, frequency of gambling and the severity level of gambling

Type of game	Frequency	PGSI level[a]			Total
		Low or no Problem N %	Moderate N %	Problem Gambling N %	N %
1. Lotto***	< once a week	795 (55.3)	36 (34.3)	6 (26.1)	837 (53.5)
	≥ once a week	642 (44.7)	69 (65.7)	17 (73.9)	728 (46.5)
	Total	1437 (100)	105 (100)	23 (100)	1565 (100)
2. Daily lotteries***	< once a week	188 (58.9)	18 (32.1)	4 (25.0)	210 (53.7)
	≥ once a week	131 (41.1)	38 (67.9)	12 (75.0)	181 (46.3)
	Total	319 (100)	56 (100)	16 (100)	391 (100)
3.Slot machine***	< once a week	412 (79.4)	50 (47.6)	11 (47.8)	473 (73.1)
	≥ once a week	107 (20.6)	55 (52.4)	12 (52.2)	174 (26.9)
	Total	519 (100)	105 (100)	23 (100)	647 (100)
4. Scratch cards#	< once a week	581 (92.7)	58 (87.9)	10 (83.3)	649 (92.1)
	≥ once a week	46 (7.3)	8 (12.1)	2 (16.7)	56 (7.9)
	Total	627 (100)	66 (100)	12 (100)	705 (100)
5. Sports Betting#	< once a week	103 (74.1)	24 (72.2)	9 (50)	136 (71.6)
	≥ once a week	36 (25.9)	9 (27.3)	9 (50)	54 (28.4)
	Total	139 (100)	33 (100)	18 (100)	190 (100)
6. Horse Race Betting*	< once a week	49 (75.4)	10 (52.6)	4 (40.0)	63 (67.0)
	≥ once a week	16 (24.6)	9 (47.4)	6 (60.0)	31 (33.0)
	Total	65 (100)	19 (100)	10 (100)	94 (100)
7. Internet gambling*	< once a week	35 (81.4)	10 (47.6)	3 (37.5)	48 (66.7)
	≥ once a week	8 (16.8)	11 (52.4)	5 (62.5)	24 (33.3)
	Total	43 (100)	21 (100)	8 (100)	72 (100)

Note: Not Significant: #; Significant: *< 0.05, **< 0.01, ***< 0.001
[a] No problem gambling included in low level of disordered gambling.
Only subjects who reported at least some amount of gambling were included in the table.

Lotto was the most frequently gambled game in this sample with 53.5% of the players having gambled lotto less than once a week, and 46.5% gambled at least once a week. Daily lotteries were gambled by 53.7% of respondents less than once a week and 46.3% gambled at least once a week. The frequency of lotto and daily lotteries betting was associated with gambling severity ($\chi^2 = 24.4$, df = 2, $p < 0.001$) and ($\chi^2 = 19.57$, df = 2, $p < 0.001$). That is, subjects with more severe level of disordered gambling gambled these games more frequently as compared to those with only low level problems or no current presentation of disordered gambling.

Slot machine gambling attracted 26.9% of the respondents to gamble at least once a week and 73.1% gambled it less than least once a week. Frequent slot machine gambling was associated with more severe level of disordered gambling ($\chi^2 = 52.57$, df = 2, $p < 0.001$).

Scratch cards attracted 7.9% of respondents at least once a week and 92.1% gambled it less than once a week. The frequency of scratch cards gambling was not associated with gambling severity ($\chi^2 = 3.14$, df = 2, $p = 0.24$).

Of the respondents, 28% bet on sports at least once a week. The frequency of sports betting was not associated with gambling severity groups ($\chi^2 = 4.58$, df = 2, $p = 0.10$).

Horse race betting was gambled by 33.0% of respondents with at least once a week frequency. Frequent horse race betting was associated with more severe level of disordered gambling ($\chi^2 = 7.14$, df = 2, $p = 0.03$).

Internet gambling was gambled by 33.3% of respondents with at least once a week frequency. Frequent internet betting was associated with more severe level of disordered gambling ($\chi^2 = 10.7$, df = 2, $p = 0.005$).

5.1.1.6 Association between socio-demographic characteristics and levels of gambling severity

The multinomial regression model (Table 6) shows the association between socio-demographic variables and levels of gambling severity. Covariates in the model were age, gender, years of education, unemployment, risk-level alcohol consumption and daily smoking. Younger age was significantly associated with all problem gambling levels. Male gender was similarly recognized to be strongly associated with all problem gambling levels. Education (less than twelve years) was also found to be significantly associated with both a low level of problem gambling and even more strongly with a moderate level of problem gambling. Unemployment was most strongly associated with problem gambling. Risk-level alcohol consumption (at least 6 units at least once a week) was significantly associated with low and moderate levels of disordered gambling. Smoking had a strong and significant association with all severity levels of disordered gambling (daily smoking was compared with occasional- and non-smoking).

According to the likelihood ratio test, the fit of the multinomial regression model was good ($\chi^2 = 275{,}9$, df = 18, $p < 0.001$.). Correct classification rate was 79.2%.

Table 6. Multinomial regression analysis of variables associated with problem gambling severity[a]

Measures	Low level of problems		Moderate level of problems		Problem gambling	
	OR	95% CI	OR	95% CI	OR	95% CI
Age[b]	0.98***	(0.97-0.99)	0.98**	(0.97-0.99)	0.97*	(0.94-0.99)
Male gender	2.46***	(1.94-3.12)	3.91***	(2.62-5.83)	7.51***	(2.78-20.29)
Education (< 12yrs)	1.28*	(1.02-1.61)	1.95***	(1.36-2.81)	1.23	(0.56-2.69)
Unemployed	1.15	(0.72-1.83)	1.25	(0.64-2.44)	4.78**	(1.89-12.07)
Risk-level alcohol consumption[c]	1.62**	(1.21-2.16)	1.96**	(1.3-2.95)	0.74	(0.28-1.95)
Smoking (daily)	1.78***	(1.35-2.33)	1.80**	(1.21-2.68)	6.08***	(2.71-13.61)

Note. * p < .01 ** p < .001 *** p < .0001
OR = Odds ratio, CI = Confidence interval
[a] Reference group: non-problem gambling.
[b] Analysed as a continuous variable.
[c] Risk-level alcohol consumption is defined as consuming at least 6 units at least once a week.

5.1.2 Results of Study II

5.1.2.1 Bivariate analysis: associations between socio-demographic characteristics and gambling subgroups

There were 3,451 participants (53.2% males and 46.8% females) with the mean age of 44.27 years (SD = 15.97). Overall, there were a greater proportion of males than females in all of the subgroups of gamblers. Compared with non-problem gamblers (52.2%) the percentage of males was greater amongst problem gamblers (85.7%) and PGs (70.0%) ($\chi^2 = 35.374$, df = 2, $p \leq 0.001$). According to this study's results, PGs were younger as compared to the other groups ($\chi^2 = 15.061$, df = 6, p = 0.019). There were statistically significantly more gamblers with twelve or less years of education in the problem gambling group (57.1%) as compared to non-problem gamblers (39.5%) and to PGs (47.5%) ($\chi^2 = 9.792$, df = 2, p = 0.007). Most of the non-problem gamblers (66.9%) were married or lived in a registered relationship or were cohabiting, while the corresponding figures for problem gamblers were 39.7 % and for PGs 50.0 %.

5.1.2.2 Bivariate analysis: associations between gambling-related factors and gambling subgroups

Onset age of gambling, namely below 18 years, was lower among problem and pathological gamblers than among non-problem gamblers ($\chi^2 = 22.174$, df = 2, $p < 0.001$). The significant others of DGs gambled more often than the significant others of non-problem gamblers ($\chi^2 = 33.177$, df = 2, $p < 0.001$). Problem gamblers (88.4%) gambled more frequently (once a week or more) as compared to PGs (77.5%) or non-problem gamblers (44.4%).

Problem gamblers spent more money on gambling than the other subgroups of gamblers (more than 5€ per week). However, the percentage of gamblers who did not know the amount they had spent on gambling was greatest among PGs ($\chi^2 = 80.405$, df = 4, $p < 0.001$).

Lotto was the most often gambled game among all subgroups of gamblers. Non-problem gamblers gambled lotto (87.6%) slightly more often than problem gamblers (87.1%) or PGs (80.0%) ($\chi^2 = 2.112$, df = 2, $p = 0.348$). Scratch cards were gambled more frequently by problem gamblers (62.3%) and PGs (62.5%) as compared to non-problem gamblers (43.4%) ($\chi^2 = 15.45$, df = 2, $p < 0.001$). Similarly, slot machine gambling was the most prevalent among problem gamblers: 90.0% of the problem gamblers, 82.5%, of the PGs and 40.7% of the non-problem gamblers ($\chi^2 = 94.750$, df = 2, $p < 0.001$) gambled slot machines. Casino gambling was the most prevalent among PGs (30.8%) as compared with problem gamblers (7.2%) or non-problem gamblers (2.4%) ($\chi^2 = 117.664$, df = 2, $p < 0.001$). Internet gambling was also the most prevalent among PGs (55%) as compared to problem gamblers (48.6%) and non-problem gamblers (23.6%) ($\chi^2 = 43.377$, df = 2, $p < 0.001$).

5.1.2.3 Bivariate analysis: Perceived health and well-being and gambling subgroups

Problem gamblers reported feelings of loneliness more often than the other subgroups of gamblers ($\chi^2 = 27.509$, df = 2, $p < 0.001$). Problem gamblers also smoked more on a daily basis than other subgroups of gamblers ($\chi^2 = 57.468$, df = 2, $p < 0.001$). According to the results, PGs consumed more alcohol at risk-level (71.4%) than problem gamblers (68.8%) and non-problem gamblers (26.9%), ($\chi^2 = 86.394$, df = 2, $p < 0.001$). PGs also experienced clinically significant mental health problems more often than the other subgroups of gamblers ($\chi^2 = 33.024$, df = 2, $p < 0.001$). However, with general health, there were no significant differences between the studied subgroups of gamblers. All in all, problem gamblers reported loneliness and smoked tobacco more than PGs, and PGs, in turn, consumed alcohol at risk-level and had mental health problems more often than problem gamblers.

5.1.2.4 Multivariate-adjusted multinomial logistic regression analysis: simultaneously analysed factors and the severity of Disordered Gambling

The simultaneously analysed socio-demographic characteristics, gambling-related factors and perceived health and well-being and the severity of DG was examined by multinomial regression analysis (Table 7). In the model used for the analysis, male gender was the only socio-demographic characteristic that was statistically significantly associated with problem gambling (OR 2.48, CI 1.20-5.12). Young age (15-35) and education ≤ 12 years were not significantly associated with either problem gambling or PG. Game type was significantly associated with DG. Past-year slot machine gambling was significantly associated with problem gambling (OR 6.88, CI 3.05-15.56) and PG (OR 4.70, CI 1.72-12.85). Likewise was the case with past-year internet gambling with problem gambling (OR 2.15, CI 1.26-3.38) and PG (OR 2.88, CI 1.40-5.92). Associations with perceived health and well-being were found to be significant with problem gambling as follows: loneliness (OR 3.47, CI 1.98-6.05), daily tobacco smoking (OR 2.01, CI 1.15-3.49) and risky alcohol consumption (OR 2.57, CI 1.43- 4.63). Similarly, risky alcohol consumption was associated with PG statistically significantly (OR 3.09, CI 1.38-6.94). In addition, mental health problems were significantly associated with PG (OR 4.01, CI 1.41-11.43).

In the multinomial model, socio-demographic characteristics (male gender, young age, education ≤ 12 years), gambling-related factors (played slot machines, internet gambling) and perceived health and well-being (loneliness, daily tobacco smoking, risky alcohol consumption, mental health problems) explained 22.9% of the variation in severity of DG (Table 7).

Table 7. Simultaneously analysed factors: socio-demographic characteristics, gambling-related factors and perceived health and well-being and the severity of disordered gambling (Problem and Pathological gambling)

	Problem gambling n = 67		Pathological gambling n = 39	
Variable	OR	95% CI	OR	95% CI
Socio-demographic				
Male	2,48*	1.20-5.12	1.10	0.49-2.46
15-34 years old	0.86	0.50-1.46	1.29	0.63-2.66
≤ 12 years education	1.53	0.90-2.60	1.25	0.61-2.54
Gambling-related				
Played slot machines, past 12 months	6.88***	3.05-15.56	4.70**	1.72-12.85
Internet gambling, past 12 months	2.15**	1.26-3.38	2.88**	1.40-5.92
Perceived health and well-being				
Feeling lonely	3.47***	1.98-6.05	1.78	0.78-4.04
Smoking daily	2.01*	1.15-3.49	1.58	0.74-3.37
Risk alcohol, AUDIT-C	2.57**	1.43-4.63	3.09**	1.38-6.94
Mental health problem, MHI-5	1.40	0.50-3.88	4.01**	1.41-11.43

Note. OR = Odds ratio, CI = Confidence interval,. The data (N = 3451) were weighted based on gender, age and residency; Multivariate-adjusted multinomial logistic regression analysis,*< 0.05, **< 0.01, ***< 0.001

[a] Reference group: Non-problem gamblers (n = 3345). AUDIT-C, the Alcohol Use Disorders Identification Test, score for risk consumption ≥ 5 among women and ≥6 among men. MHI-5, the Mental Health Inventory, scaled into 1-100, clinically significant problem ≤ 52.

5.2 Findings of the Treatment studies

Basic findings of the treatment Studies III and IV were that age, onset age, length of the time gambled, alcohol use and depression were associated with disordered gambling. Furthermore, urge to gamble and impaired control of gambling were the strongest predictors for disordered gambling.

Study IV extended Study III by investigating the efficacy of the offered treatment. The significant improvements after treatment were found in the following variables: gambling-related problems (NODS), urge to gamble, alcohol consumption, gambling-related erroneous thoughts and depression. Improvements were also observed with increased control of gambling and decrease of gambling-related negative social consequences.

5.2.1 Study III

5.2.1.1 Socio-demographic characteristics

The mean age of participants was 34.5 years (SD = 11.8). Females were older (M = 40.1, SD = 14.2) than males (M = 32.0, SD = 9.73) (t = -7.23, df = 466, p < 0.001). The mean onset age was 23.3 years (SD = 12.2). Males had started gambling significantly earlier (M = 20.1, SD = 9.55) as compared to females (M = 30.6, SD = 14.38) (t = -9.344, df = 462, p < 0.001). Correspondingly, males had gambled longer (M = 11.96, SD = 7.50) than females (M = 9.17, SD = 7.37) (t = 3.66, df = 461, p < 0.001).

5.2.1.2 Gambling measure

Of the total 459 participants, 6.7% had no current presentation of disordered gambling, 10.0% gambled at risk-level, 14.8% were problem gamblers and 64.0% were categorized as pathological gamblers. Specific gender differences are shown in Table 8. Females had slightly more severe level of disordered gambling (M = 5.53, SD = 2.96) than males (M = 3.54, SD = 2.68), but this difference was not statistically significant.

Table 8. Four categories of NODS Scores and percentages in each category with gender differences

	Score		N	Percentage
NODS	Males	0	29	9.3
		1-2	31	10.0
		3-4	43	13.8
		5-10	208	66.9
Total			311	
NODS	Females	0	2	1.4
		1-2	17	12.0
		3-4	26	18.3
		5-10	97	68.3
Total			142	

Note. Score: 0 = no gambling problem, 1-2 risky gambling habits, 3-4 = problem gambling, 5-10 = PG

5.2.1.3 Comorbid disorders: depression and alcohol consumption

In this particular treatment-seeking sample, females were found to be more depressed (M = 16.6, SD = 8.71) as compared to males (M = 14.70, SD = 8.81; the one-way ANOVA: F (1.434) = 5.08, p < 0.025). Males consumed more alcohol (M = 8.92, SD = 2.09) than females (M = 7.39, SD = 8.71); F (1.406) = 44.34, p < 0.001).

5.2.1.4 *Gambling-related erroneous thoughts, gambling urge, impaired control and social consequences*

Males (M = 5.21, SD = 2.87) had significantly more gambling-related erroneous thoughts than females (M = 4.61, SD = 2.56), the one-way ANOVA, F (1.471) = 3.45, $p < 0.064$. All participants scored rather high regardless of gender: males (M = 8.86, SD = 1.29) and females (M = 8.86, SD = 1.27). Females had slightly better control over their gambling (M = 2.45, SD = 1.12) as compared to males (M = 2.28, SD = 1.02). Yet the difference was not statistically significant.

5.2.1.5 *Types of gambling and wagers*

Among this treatment-seeking sample, slot machine was the most gambled game (57%). Males gambled significantly more than females ($\chi^2 = 13.480$, df = 1, $p < 0.001$). 34.3% of the participants gambled betting games and the Lotto by Veikkaus (Finnish National Betting Agency), with males betting significantly more than females $\chi^2 = 7.180$, df =1, $p < 0.01$. Miscellaneous internet gambling was gambled by 30.1% of the participants with no gender differences. Internet poker by RAY (Finnish Slot Machine Association) was gambled by 19.7% of all participants, males gambling significantly more than females ($\chi^2 = 20.429$,df = 1, $p < 0.001$). Other internet gambling, e.g., internet poker by PAF and international poker sites, were gambled by 5.6% of the participants. Casino gambling was gambled by 11.3% of the participants. Track horse race betting was gambled by 4.2% of participants.

The money wagered in gambling (€) per one week over the past month was (M = 305.05, SD = 765.50). Weekly money wagered during the past year was (M = 795.70, SD = 390.20). Money wagered in each gambling session per past month was (M = 148.50, SD = 390.20). Money wagered in each gambling session over the past year was (M = 605.00, SD = 5308.40). No specific gender differences were found.

5.2.1.6 *Predictors for disordered gambling*

Predictors for disordered gambling using gender, duration of gambling (in years), gambling-related erroneous thoughts, social consequences, depression, alcohol use, urge to gamble and impaired control were created in three steps. In the first step, gambling-related erroneous thoughts and negative social consequences were significant predictors (B = 0.097, t = 1.998, $p < 0.05$) explaining only 0.82% of the problem. In the second step, depression seemed to overpower previous predictors (B= 4.16, t = 8.335, $p < 0.001$) explaining 2.16% of the problem. In the third step, depression (B = 0.254, t = 6.331, $p < 0.001$), urge to gamble (B = 0.184, t = 3.820, $p < 0.001$) and impaired control (B = 0.254, t = 5.215, $p < 0.001$) were the strongest predictors of disordered gambling, explaining 3.1% of the problem.

5.2.2 Study IV

In Study IV, there were 224 participants that completed the treatment program. The retention rate was 48.0%. The 6-month follow-up retention rate was 16.2% and 12-month follow-up retention rate was 8.8%.

5.2.2.1 Severity of gambling

Severity of disordered gambling measured by NODS declined after the treatment (OR = 0.041, $p < 0.001$). Table 9 shows NODS scores in baseline, post-treatment and 6-month follow-up.

Table 9. NODS scores at the baseline, post-treatment and 6-month follow-up phases

Time	NODS score N (%)		Total
	0-4	5-10	
Baseline	151 (33)	308 (67)	459 (100)
Post-treatment	203 (92)	18 (8)	221 (100)
6-month follow-up	70 (95)	4 (5)	74 (100)

5.2.2.2 Comorbid disorders: depression and alcohol consumption

The results show that depressive mood improved after the treatment (B = -7.80, $p < 0.001$). Also, consumption of alcohol decreased after the treatment (B = -0.66, $p < 0.001$). Males consumed significantly more alcohol as compared to females (B = -1.32, $p < 0.001$). Onset age of gambling was also found to be associated with alcohol consumption (B = -0.032, $p < 0.001$), indicating that those who had started their gambling earlier consumed more alcohol as compared to those who had started their gambling later (Table 10).

5.2.2.3 Social consequences and gambling-related erroneous thoughts

An improvement in social consequences occurred after the treatment (B = -0.25, $p < 0.001$) and remained unchanged in the 6-month follow-up (B = -0.63, $p < 0.001$). Gambling-related erroneous thoughts declined significantly (B = -1.96, $p < 0.001$) after 8 weeks of treatment. Gambling-related erroneous thoughts were also linked with earlier onset age of gambling (B = -0.04, $p < 0.001$), indicating that those who had started to gamble earlier fostered more gambling-related erroneous thoughts (Table 10).

Table 10. Linear regression table: Estimates (B) and standard deviations (SD) for alcohol consumption (AUDIT-C), social consequences, gambling-related erroneous thoughts and depression (MADRS-S)

Variable	AUDIT-C		Social consequences		Erroneous thoughts		MADRS-S	
	B	SD	B	SD	B	SD	B	SD
Baseline – Post-treatment	-0.66***	0.13	-0.25***	0.05	-1.96***	0.19	-7.8***	0.53
Post-treatment – 6 months	-0.33	0.32	-0.63***	0.11	0.48	0.3	-0.34	1.09
Female	-1.32***	0.25	0.07	0.07	0.06	0.25	0.95	0.80
Onset Age	-0.032***	0.009	-0.002	0.002	-0.038***	0.01	-0.013	0.03

Note: CI = Confidence Interval. *p < 0.05. **p < 0.01. ***p < 0.001. Generalized Estimating Equations (GEE) were used to estimate the regression parameters.

5.2.2.4 Gambling urge and impaired control

The urge to gamble decreased significantly from baseline to post-treatment phase (OR = 0.53, p < 0.05). In turn, participants' control over gambling increased significantly after the treatment (OR = 0.88, p < 0.001) (Table 11).

Table 11. Logistic regression table: Odds ratios (OR) and confidence intervals (CI) for severity of disordered gambling (NODS), gambling urge and impaired control of gambling

Variable	NODS		Gambling urge		Impaired control	
	OR	95% CI	OR	95% CI	OR	95% CI
Baseline – Post-treatment	0.041***	0.024 - 0.067	0.036***	0.018 - 0.069	0.088***	0.049 - 0.157
Post-treatment – 6 months	0.69	0.22 - 2.15	0.53*	0.31 - 0.90	0.96	0.30 - 3.08
Female	1.09	0.70 - 1.68	1.13	0.65 - 1.70	1.31	0.87 - 1.99
Onset Age	1.00	0.98 - 1.01	0.99	0.97 - 1.01	1.00	0.98 - 1.01

Note: OR = Odds Ratio, CI = Confidence Interval. *p < .05. **p < .01. ***p< .001. Cut-offs in the outcomes were: > 4 for NODS score (PG), > 5 for Gambling urge and > 2 for Impaired control. Generalized Estimating Equations (GEE) were used to estimate the regression parameters.

A significant decrease in wagering occurred after the treatment. On average the participants wagered 133.73 € less each week (t (153) = -4.08, p < 0.001).

The therapists of the program revealed that the qualitative feedback from the participants was extremely positive.

6 Discussion

The present thesis approaches disordered gambling from two angles. The epidemiological angle provides an overall picture of the current situation in Finland. The treatment angle studies disordered gambling from an individual standpoint.

The epidemiological part of the thesis investigates the prevalence of disordered gambling and related socio-demographic factors, commonly co-occurring psychiatric disorders and types of gambling among the Finnish adult population sample. Additionally, associations between gambling-related factors and severity of disordered gambling were studied. The treatment part of the thesis investigates socio-demographic correlates and co-occurring psychiatric disorders of treatment-seeking gamblers and moreover, evaluates how the only treatment option, using an evidence-based approach, currently offered in Finland worked in practice.

6.1 Epidemiological Studies I and II

6.1.1 Prevalence

The epidemiological Study I shows that the current prevalence rate of disordered gambling in Finland has stayed unchanged for the past few years, and is within the average rate category according to international comparisons (Williams et al., 2012). However, the results of the epidemiological Study II suggest that the less severe level of gambling could be higher than expected, and should be closely monitored in the future. Here, the less severe level of gambling refers to gamblers who score low in gambling screens (sometimes referred to as at-risk level gamblers). The follow-up of this specific group of gamblers is important because disordered gambling is transient in nature, and shifts from one severity level to another may occur. Those individuals who are currently experiencing moderate levels of problems caused by gambling may be at risk of developing more severe forms of disordered gambling, especially in surroundings where gambling opportunities are abundant.

6.1.2 Socio-demographic characteristics

This thesis indicates that particular socio-demographic characteristics are evidently associated with disordered gambling. Predominantly, they are: younger age, early onset age of gambling, male gender, low socio-economic status (unemployment and lower level of education) and "divorced" or "single" marital status as also found in several previous studies (Black et al., 2012; Johansson et al., 2009; Kessler et al., 2008; Welte et al., 2008; Blanco et al., 2006; Toneatto & Nguyen, 2007).

It is important to acknowledge that early onset age of gambling as well as young age are both associated with disordered gambling and contribute to its development. Young males seem to be especially more at risk for developing disordered gambling. Some studies suggest that young males are characteristically sensation seekers and have a higher susceptibility of developing addictions in general (Blaszczynski et al., 1985; Bonnaire et al., 2009). These particular characteristics of sensation seeking may reflect the tendency of males to prefer games that are riskier in nature (betting games and internet poker).

Young males may be at a greater risk of having and developing disordered gambling than young females or females in general. However, females should also be taken into account when developing public health prevention and treatment programs, as a vast body of research shows that the progression of disordered gambling is more rapid in females as compared to males (Ladd & Petry, 2002). The recent study of Grant, Odlaug and Mooney (2012) revealed that female gamblers have both higher mean age of gambling initiation than males, as also found among the treatment-seeking participants analysed in this thesis, and shorter time of developing disordered gambling than males. This gender-specific course is called the telescoping phenomenon (Grant et al., 2010). The telescoping phenomenon should be seen as a gender-specific course of disordered gambling that is unrelated to psychiatric comorbidities as suggested by Grant, Odlaug and Mooney (2012).

The present epidemiological Study I finds that less than twelve years of education, and unemployment are associated with disordered gambling. The second epidemiological study confirms that a low level of education is associated with disordered gambling. Viewing low level of education and unemployment as a reflection of low socio-economic status, there have been some hypotheses proposed as to an explanation of this association. Some proposed hypotheses are that individuals with low socio-economic status have challenges in understanding the probabilities of gambling (Petry, 2005). Individuals with challenging and distressed life situations may be more risk-prone to gamble (Yu & Lagnado, 2012), and despairing economical situations may have an impact on overall psychological well-being (Costello, Compton, Keeler & Angold, 2003). These, in turn, may lead to deterioration in social status (Dohrenwend, 1990), which could then increase a vulnerability to psychiatric well-being. With this in mind, it is important to recognize that low socio-economic status is a vulnerability factor with disordered gambling.

The present epidemiological Study II finds that "single" marital status was especially associated with disordered gambling, as also found in a Norwegian epidemiological study (Bakken, Götestam, Grawe, Wentzel & Oren, 2009). This study finds that there are more separated, divorced or widowed individuals who have disordered gambling as compared to non-problem gamblers, as also found by Black, Shaw, McCormick, and Allen (2012). Divorced or separated individuals may be so either as a result of having disordered gambling, or they may be more hesitant to engage themselves because of an incapability to form a permanent relationship (Petry, 2004).

6.1.3 Types of games gambled

Previous studies have found that accessibility and availability of gambling opportunities increases the risk of disordered gambling (Wardle et al., 2012; Rush et al., 2007). Lotto appears to be the most popular game in Finland, as shown by the present epidemiological Studies I and II. However, slot machine gambling appears to be the one that is causing the most trouble among treatment-seeking individuals, as was found in the present treatment Study III. This is confirmed with the similar notion from a clinical setting in Finland (Jaakkola, Murto, Pajula, 2012). Furthermore, Studies I and II also found slot machine gambling to be associated with more severe level of disordered gambling (Wardle et al., 2012; Hodgins et al., 2012; Dixon et al., 2012; Productivity Commission, 2010; Gerstein et al., 1999). In addition, more frequent gambling, especially in lotto, daily lotteries, slot machines, horse race betting and internet gambling, was logically increasing the severity of disordered gambling. Finland offers unique possibilities to gamble: widespread locations of slot machines from kiosks to round-the-clock fuel stations allure passers-by to try their luck with the game of chance.

Although the prevalence of disordered gambling in Finland is within the range of other European countries, it could be lower by reducing gambling opportunities.

6.1.4 Comorbidities

The results of this thesis are in agreement with most previous research outcomes. The present results show that common comorbid substance use, alcohol and nicotine use in particular, were often co-occurring with disordered gambling. Males consume more alcohol as compared to females. According to these results, alcohol use is also found to be a significant predictor for disordered gambling. In addition to alcohol use, nicotine dependency is associated with disordered gambling as was also discovered by other research groups (Götestam & Johansson, 2003; Sproston et al., 2000; Gerstein et al., 1999). Nicotine dependence and disordered gambling could be linked together, as suggested by Potenza and colleagues (2004), as they found that nicotine-dependent gamblers were more likely to have problems with other dependencies as well. Furthermore, one dependence may serve as a prime for another, as noted by McGrath and Barrett (2009). Nicotine-dependent gamblers are also reported to have less control of gambling (Petry & Oncken, 2005).

Along with other co-occurring dependencies, disordered gambling was found to be associated with depression, overall negative self-perceived mental health status and loneliness. This confirms the earlier findings in both epidemiological and treatment samples (Park et al., 2010; Black et al., 2008; Kessler et al., 2008). Loneliness in particular was found to be associated with disordered gambling. Loneliness may reflect either vulnerability or the consequence of disordered gambling (Trevorrow & Moore, 1998). Loneliness may also reflect the social isolation or boredom linked with disordered gambling (McCormack et al., 2012; Hopley et al., 2010; Trevorrow & Moore, 1998; Blaszczynski et al., 1990).

6.2 Treatment Studies III and IV

6.2.1 Socio-demographic characteristics and comorbidities of the treatment-seeking sample

The present treatment Study III evaluates socio-demographic characteristics and comorbidities of the treatment-seeking sample. 78.8% of the participants were disordered gamblers. The socio-demographic characteristics of the treatment-seeking sample are rather similar when compared to epidemiological studies. Males gamble more than females and their onset age of gambling is lower than that of females. Females in this sample appear more depressed than males, which is in line with previous studies (Grant et al., 2012). In turn, males use more alcohol than females.

The unique finding of this study was that early onset age of gambling is associated with more gambling-related erroneous thoughts and alcohol consumption. Those who had started gambling earlier had more of those thoughts and used more alcohol as compared to those who had started gambling later. Early onset age of gambling and alcohol use as risk factors for disordered gambling were discussed above, and should be noted along with the other possible risk factors of early onset age and gambling-related cognitive erroneous thoughts. It could be possible that the earlier one starts gambling, the deeper the roots of erroneous thoughts or beliefs related to gambling extend.

6.2.2 Evaluation of PP Program

Treatment options for disordered gambling are still very limited in a small country like Finland. The only treatment currently available in Finland that uses an evidence-based approach is PP program's internet-based therapy, with weekly therapist phone support using CBT. The results of this explorative study reveal that the PP program addresses disordered gambling adequately and clear improvements were observed after the treatment and even in the six-month follow-up phase. Implementation of the PP program significantly reduces gambling-related problems, gambling-related erroneous thoughts, gambling urge and improves control of gambling. In addition, the mood of participants improved, the alcohol use decreased and the participants reported their social situations to be improved after the treatment. These observed changes are in line with the previous findings of a similar internet-based program, conducted in Sweden, by Carlbring and Smit (2008) and Carlbring and colleagues (2012).

The results of Study IV are encouraging and suggest that the ingredients of the PP program are effective at treating disordered gambling, in this sample. It is vital to identify the most meaningful elements of this program, especially in a Finnish context, where there is yet no consensus on how disordered gambling should be treated. The main elements of the PP program are motivational enhancement,

recognition of gambling behaviour, and recognition of gambling-related erroneous thoughts and reflection of social consequences of gambling.

Motivational interviewing and enhancement (Miller, 1983; Miller & Rollnick, 2002) are important components in treating addictions, because they keep participants engaged with their process of change. If the gambling-related erroneous thoughts, such as illusion of control, misperception of randomness and independence of events, that are fuelling gambling (Langer, 1975; Hill & Williams, 1998; Ladouceur, 2004; Toneatto, Bliz-Miller et al., 1997; Toneatto & Ladouceur, 2003) are properly addressed, participants would perceive their gambling situations more realistically. Impaired control, which is a central component in the construct of addiction (Gossop et al., 2006) and dependency (Martins et al., 2006), also improved after the treatment. Improvements in both the understanding of gambling-related erroneous thoughts and control of gambling are crucial because, as proposed by Cantinotti and colleagues (2009), gambling-related erroneous thoughts relate to positive expectations of success and in a gambling situation may actually influence erroneous perceptions, which in turn may contribute to feeling less in control in a gambling situation, and potentially lead to a vicious circle of disordered gambling as shown in Figure 2 (Ladouceur & Lachance, 2007).

These findings are fundamental in a Finnish context. The PP program reaches individuals who may not have access to any treatment facilities at all around the country. Therefore, the PP program should be continued as a low threshold treatment option for disordered gambling in Finland. The findings of this study should also be taken into account for planning face-to-face treatment options for disordered gamblers. As based on international meta-analyses of treatment options for disordered gambling, cognitive and cognitive behavioural therapies are clearly recommended as evidence-based treatment options for disordered gambling (PGTRC, 2011; Lahti et al., 2012b).

6.3 Limitations

6.3.1 Epidemiological Studies I and II

Despite the large sample size and the good representation of the Finnish population there are a number of challenges regarding the comparison of the two epidemiological studies.

First, the method of survey administration was different in the two epidemiological studies. One was a self-administered postal survey, and the other a telephone interview. Self-administered surveys tend to produce more valid reports of sensitive behaviour as compared to responses given to an interviewer (Tourangeau & Smit, 1996; van der Heijden et al., 2000). Williams and colleagues (2012) suggest that a good comparison between these two would be achieved by using correction weights as based on each survey's response rate.

Second, another important methodological difference known to have an impact on disordered gambling prevalence rates, is how the survey is described to participants. One study was a health-related questionnaire and the other a gambling survey. In fact, a gambling survey tends to produce higher prevalence rates as compared to a health survey. The pitfall here is that a gambling survey creates a sampling bias by causing gamblers, who are interested in this topic, to participate actively and a greater refusal by non-gamblers who are not interested (Williams et al., 2012).

Third, the two surveys used different instruments: SOGS and PGSI. PGSI has been identified as more conservative than SOGS because of its wider cut-off points (8 points in PGSI and 5 points in SOGS).

Last but not least, a considerable methodological limitation is that neither scale is validated in a Finnish cultural context. This thesis brings up the importance of the need for validation of gambling scales, epidemiological and treatment, in a Finnish cultural context.

6.3.2 Treatment Studies III and IV

A limitation of the present treatment studies was a relatively low retention rate, especially with 6-and 12-month follow-up phases. Two reasons were found for this: a) the treatment program was implemented mainly for clinical purpose and therefore the data collection was not appropriately followed through, and b) in the follow-up phases the questionnaire sent to the participants was not carefully monitored, causing missing data or incomplete answers.

The treatment Studies III and IV used NODS as an instrument of measuring disordered gambling. However, NODS tends to produce a higher rate of problems when compared to clinical interview (Murray, Ladouceur & Jacques, 2007). These problems arise first, because NODS uses a dichotomous modality, which restricts participants' choices in rating criteria. Second, NODS has a maximum score of 10, which is considered small, because one misunderstood question is enough to categorize a person incorrectly (Murray et al., 2007). The main limitation of the treatment studies was the lack of a comparison group or even the use of a wait-list comparison.

6.4 Conclusions and clinical implications

6.4.1 Increasing awareness

Disordered gambling is often a hidden problem, creating feelings of shame and guilt due to excessive gambling. Denial of the problem is also rather common and can therefore be undetected and unrecognized for a considerable time. Hence, the early identification of disordered gambling within a health care system can be challenging.

Therefore, by increasing health care practitioners' awareness of disordered gambling and its common comorbid disorders, early detection can be achieved. For example, including gambling screens to usual health checks would possibly increase early detection. In addition, the second epidemiological study found association between smoking and disordered gambling, found earlier by Petry and Oncken (2002). Therefore, it is important to acknowledge this existing association both in a public health setting and when planning treatment. Smoking can be an indicator that a person may have other addictive disorders, and have even more severe psychological stress that may have an influence on the response to treatment as suggested by Petry and Oncken (2002).

6.4.2 Choice to gamble vs. informed choice to gamble

As stated in the Reno Model by Blaszczynski and collaborators (2004), the comprehensive suggestions for a responsible gambling program have two fundamental principles: "1) the ultimate decision to gamble resides with the individual and represents a choice, and 2) to properly make that decision, individuals must have the opportunity to be informed". This statement stems from the context of civil liberties, where external organizations cannot remove an individual's right to make decisions.

In looking at gambling as a choice, accurate information would provide the foundation upon which individuals form opinions and make choices to gamble or not to gamble. As encouraged in the Reno Model the gambling industry should adopt a policy of accurate disclosure. In practice, this means that they should offer realistic information of probabilities and likelihood of winning as well as schedules of payouts. In addition, industry standards of ethical practice should be met: advertising should not present misleading information or misrepresentations of a chance to win.

Another suggestion in the Reno Model is to enhance collaboration between key stakeholders and researchers.

In addition to responsible gambling policy, perhaps implementing a product warning, providing information about the harmful effects and possible negative consequences of gambling should be considered. This method of protecting the public has worked in the fields of alcohol and tobacco. It would do no harm to implement the same to gambling products as well.

6.4.3 Availability, accessibility and acceptability

Results of this thesis show that availability and accessibility factors were associated with disordered gambling. Easily available and accessible slot machines are a strong predictor for disordered gambling, and the most trouble causing type of gambling for treatment-seeking gamblers in Finland. Regarding availability and easy access to

gambling opportunities, much can be done especially in Finland. There are examples of where reduction of gambling opportunities have been implemented (Marshall, 2009; Caraniche Pty Ltd, 2005). When the new casino opens in the eastern part of Finland (Murto, 2012), it will be important to closely monitor the impact of gambling-related harms in that specific region. The reason for suggesting this is the results of the Cox, Yu, Affifi and Ladouceur (2005) study showing that a high concentration of slot machines, and the presence of a permanent casino were associated with an increased prevalence of gambling.

Regarding acceptability as to lotto gambling, there is a need for research. Some studies have found that lottery gambling especially attracts individuals with a low socio-economic status (Barnes, Welte, Tidwell & Hoffman, 2011). These findings should be studied in a Finnish context.

6.4.4 Follow-up of age limit and target for prevention

The recently set age limit to gamble (18 years) is a positive preventive step, but needs to be monitored carefully in the future, based on the Warpenius et al. (2012) findings that the implementation of age restriction was not accurately followed up by shopkeepers in the gambling venues (e.g., kiosks, supermarkets and fuel stations). Minors should be prohibited from engaging in gambling activities according to law, as has been done in the fields of alcohol and tobacco. In addition, more attention should be paid to the popular tax-free cruises between Finland's south and west coast to Estonia and Sweden. Although the law has set the age limit, the control of that law particularly on those ships leaves room for improvement. This is a vital point, because early onset age of gambling is a clear risk factor for further development of disordered gambling.

As younger age is a clear risk factor of developing disordered gambling, a prevention programme for schools is highly recommended. Prevention programs should target possible future generations of gamblers primarily adolescents. Excellent examples of prevention programs are in use in the US and Canada.

6.4.5 Treatment of disordered gambling

Treatment options for disordered gambling in Finland are still very limited. It would indeed be beneficial to include evidence-based treatment options for individuals in need of treatment. At the moment though, there is no consensus on how disordered gambling should be treated in Finland. This discrepancy possibly stems from an overall tradition of treating addictions in Finland. In a Finnish cultural context, treatment of addictions has been provided by social workers based on a supportive model while the international treatment approach, especially for disordered gambling, has been based on a medical model which includes a strong research interest to evaluate the efficacy of the treatments provided. Despite the cultural tradition for the treatment of addictions, evidence-based treatment should be put into practice in Finland. In

order to ensure that the best practice available is applied to treat disordered gamblers in Finland, international research and recommendations and ethical principles of clinical practice should be carefully followed (e.g., competence, responsibility and integrity; cf. EFPPA, Meta-code of ethics, 1995). Investments made in new pilot projects (collaboration between psychiatric and addiction clinics) offer an excellent opportunity to apply research-based treatment options into practice.

It is highly recommended to consider manualised treatments to the choice of treatment options for disordered gambling to further evaluate their efficacy in a Finnish cultural context.

6.4.6 Future research

This thesis used samples from the adult population. In the future, more studies from different age groups are needed. The association of elderly individuals' quality of life and possible loneliness with disordered gambling has thus far been little studied. In addition, more studies are needed about disordered gambling among Finnish adolescents.

More studies are also needed about gender-specific differences of disordered gambling in Finland.

Validation of the gambling screens in a Finnish cultural context is also needed.

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8 References

Abbott MW, Volberg RA. Gambling and Problem gambling in New Zealand: Report on Phase One of the National Survey. Research series No 12. Department of Internal affairs, Wellington, NZ, 1991.

Abbott MW, Volberg RA. Frequent and problem gambling in New Zealand. Research series No 14. Department of Internal affairs, Wellington, NZ, 1992.

Abbott MW, Volberg RA. 'The New Zealand National Survey of problem and pathological gambling'. Journal of Gambling Studies 1996; 12(2): 143-160.

Abbott MW, Volberg RA. Gambling and problem gambling in the Community: An International Overview and Critique. Report Number One of the New Zealand Gambling Survey. Department of Internal affairs, Wellington, NZ, 1999.

Afifi TO, Cox BJ, Martens PJ, Sareen J, Enns MW. The relationship between problem gambling and mental and physical health correlates among a nationally representative sample of Canadian women. Can J Public Health 2010; 101(2): 171-5.

Alcoholics Anonymous, First edition, New York: Works Publishing Company, 1939.

American Psychiatric Association. DSM-IV: Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition. Washington, D.C.: American Psychiatric Association; 1994.

American Psychiatric Association. DSM-5: Diagnostic and Statistical Manual of Mental Disorders. Washington, D.C.: American Psychiatric Association; 2013.

Bakken IJ, Götestam KG, Gråwe RW, Wenzel HG, Øren A. Gambling behavior and gambling problems in Norway 2007. Scand J Psychol 2009;50 (4):333-9.

Barnes GM, Welte JW, Tidwell MC, Hoffman JH. Gambling on the lottery: sociodemographic correlates across the lifespan. J Gambl Stud 2011;27 (4): 575-86.

Berwick DM, Murphy JM, Goldman PA, Ware Jr JE, Barsky AJ, Weinstein MC: Performance of a five-item mental health screening test. Medical Care 1991; 29:169–76.

Black DW, Arndt S, Coryell WH, et al. Bupropion in the treatment of pathological gambling: a randomized, double-blind, placebo-controlled, flexible-dose study. J Clin Psychopharmacol 2007; 27: 143-150.

Black D, Shawn M. Psychiatric comorbidity associated with pathological gambling : a clear connection with other impulse-control disorders. Psychiatr Times 2008; 25:14.

Black DW, Shaw MC, McCormick BA, Allen J. Marital Status, Childhood Maltreatment, and Family Dysfunction: A Controlled Study of Pathological Gambling. Journal of Clinical Psychiatry 2012; 73(10): 1293-1297.

Blanco C, Hasin DH, Petry N, Stinson FS, Grant B. Sex differences in subclinical and DSM-IV pathological gambling: results from the National Epidemiological Survey on Alcohol and Related Conditions. Psychological Medicine 2006; 36: 943-953.

Blaszczynski AP, Buhrich N, McConaghy N. Pathological gamblers, heroin addicts and controls compared on the E.P.Q. 'Addiction Scale'. Br J Addict 1985; 80(3): 315-9.

Blaszczynski A, McConaghy N, Frankova A. Boredom proneness in pathological gambling. Psychol Rep 1990; 67(1): 35-42.

Blaszczynski A, McConhaghy N, Frankova A. A comparison of relapsed and non-relapsed abstinent pathological gamblers following behavioral treatment. British Journal of Addiction 1991; 86:1485-1489.

Blaszczynski A, Steel Z, McConaghy N. Impulsivity in pathological gambling: the antisocial impulsivist. Addiction 1997; 92: 75-87.

Blaszczynski A, Nower L. A pathways model of problem and pathological gambling. Addiction 2002; 97: 487-499.

Blaszczynski A, Ladouceur R, Shaffer HJ. A science-based framework for responsible gambling: the Reno model. J Gambl Stud 2004; 20(3): 301-17.

Bondolfi G, Oslek C, FerreroF. Prevalence esitimates of pathological gambling in Switzerland. Acta Psychiatr Scand; 2000; 101: 473-475.

Bondolfi G, Jermann F, Ferrero F, Zullino D, Osiek C. Prevalence of pathological gambling in Switzerland after the opening of casinos and the introduction of new preventive legislation. Acta Psychiatr Scand 2008; 117(3): 236-9.

Bonnaire C, Bungener C, Varescon I. Subtypes of French pathological gamblers: comparison of sensation seeking, alexithymia and depression scores. J Gambl Stud; 2009: 25(4): 455-71.

Brady KT, Randall CL. Gender differences in substance use disorders. Psychiatr Clin North Am 1999; 22(2): 241-252.

Brown R, Killian E, Evans WP. Gambling attitudinal and behavioral patterns and criminality in a sample of Las Vegas area detained youth. Journal of Gambling Issues; 2005: Retrieved April 2012, from http://www.camh.net/egambling/issue13/jgi

Brown S, Coventry L. Queen of hearts: the needs of women with gambling problems. Melbourne, Australia: Financial Consumer rights Council, 1997.

Bush K, Kivlahan DR, McDonell MB, Fihn SD,Bradley KA. The audit alcohol consumption questions (Audit-C): An effective brief screening test for problem drinking. Archives of Internal Medicine 1998; 158: 1789–95.

Cantinotti M, Ladouceur R, Jacqcues C. Lay and scientific conseptualisations of impaired control at electronic gambling machines. Addiction Research and Theory 2009; 17(6): 650-667.

Caraniche Pty Ltd (Caraniche): Evaluation of Electronic Gaming Machine Harm Minimisation Measures in Victoria. Department of Justice (Victoria), Melbourne 2005.

Carlbring P, Smit. F. Randomized trial of Internet- delivered self-help with telephone support for pathological gamblers. Journal of Consulting and Clinical Psychology 2008; 6: 1090–1094.

Carlbring P, Degerman N, Jonsson J, Andersson. G. Internet-based treatment of pathological gambling with a three-year follow-up. Cognitive Behaviour Therapy 2012; 41: 1–14.

Cowlishaw S, Merkouris S, Dowling N, Anderson C, Jackson A,Thomas S. Psychological therapies for pathological and problem gambling. Cochrane Database of Systematic Reviews 2012, Issue 11. Art. No.: CD008937. DOI: 10.1002/14651858.CD008937.pub2.

Corless T, Dickerson M. Gamblers' self-perceptions of the determinants of impaired control. Br J Addict 1989; 84(12): 1527-37.

Costello EJ, Compton SN, Keeler G, Angold A. Relationships between poverty and psychopathology: a natural experiment. JAMA; 2003: 290(15): 2023-9.

Cox B, Yu N, Afifi T, Ladouceur R. A National survey of gambling problems in Canada. Canadian Journal of Psychiatry 2005; 50: 213-217.

Crisp BR, Thomas SA, Jackson AC, Smith S, Borrell J, Ho WY, et al. Not the same: a comparison of female and male clients seeking treatment from problem gambling counseling services. Journal of Gambling Studies 2004; 20: 283-299.

Cunningham JA. Little use of treartment among problem gamblers. Psychiatric Services 2005; 56: 1024–1025.

Cunningham JA. Internet-based interventions for alcohol, tobacco and other substances of abuse. In P. Miller & D. Kavanagh (Eds.), Translation of addictions science into practice (pp. 399–438). New York: Elsevier-Pergamon, 2007.

Cunningham JA, Hodgins DC, Toneatto T. Natural and treatment-assisted recovery from gambling problems. Results from a general population survey. Sucht 2009; 55: 99-103.

Cunningham JA, Cordingley J, Hodgins DC, Toneatto T. Beliefs about gambling problems and recovery: results from a general population telephone survey. J Gambl Stud; 2011: 27(4): 625-31.

Cunningham-Williams RM, Cottler LB, Compton WM 3rd, Spitznagel EL.Taking chances: problem gamblers and mental health disorders--results from the St. Louis Epidemiologic Catchment Area Study. Am J Public Health 1998; 88(7): 1093-6.

Cunningham-Williams RM, Ostmann EL, Spitznagel EL, Books SJ. Racial/Ethnic Variation in the Reliability of Pathological Gambling Disorder. Journal of Nervous and Metal Disease 2007.

Davis D. The queen of diamonds: Women and compulsive gambling. In S. Straussner 6 S. Brown (Eds.), the Handbook of addiction treatment for women (pp. 99-126. San Fransisco: Jossey-Bass, 2002.

Desai RA, Potenza MN. Gender differences in the associations between past-year gambling problems and psychiatric disorders. Social Psychiatry and Psychiatric Epidemiology 2008; 43: 173-183.

DiClemente CC, Prochaska JO. Self-change and therapy change of smoking behavior: a comparison of processes of change in cessation and maintenance. Addict Behav 1982; 7(2): 133-42.

Dickerson M, Cunningham R, England SL, Hinchy J. On the determinants of persistent gambling. III. Personality, prior mood, and poker machine play. Int J Addict; 1991: 26(5): 531-48.

Dickerson M, Baron E. Contemporary issues and future directions for research into pathological gambling. Addiction 2000; 95(8): 1145-59.

Dickerson M. The evolving contribution of gambling research to addiction theory. Addiction 2003; 98(6): 709.

Dixon MJ, Maclaren V, Jarick M, Fugelsang JA, Harringan KA. The Frustrating Effects of Just Missing the Jackpot: Slot Machine Near-Misses Trigger Large Skin Conductance Responses, But No Post-reinforcement Pauses. J Gambl Stud; 2012 Oct 7. [Epub ahead of print].

Dohrenwend BP. Socioeconomic status (SES) and psychiatric disorders. Are the issues still compelling? Soc Psychiatry Psychiatr Epidemiol 1990; 25(1): 41-7.

Dostoevsky, F. The Gambler. The Project Gutenberg EBook of The Gambler, by Fyodor Dostoyevsky. Retrieved from: http://www.gutenberg.org/files/2197/2197-h/2197-h.htm.

Echeburua E, Baez C, Fernandez-Montalvo J. Comparative effectiveness of three therapeutic modalities in the psychological treatment of pathological gambling: Long term outcome. Behavioural and Cognitive Psychotherapy 1996; 24 (1): 51-72.

el-Guebaly N, Patten SB, Currie S, Williams JV, Beck CA, Maxwell CJ, Wang JL. Epidemiological associations between gambling behavior, substance use & mood and anxiety disorders. Journal of Gambling Studies 2006; 22(3): 275-287.

European Federation of Psychologists' Association (EFFPA). Meta Code of Ethics, 2005 [http://www.efpa.eu/ethics/ethical-codes].

Feigelman W, Wallisch LS, Lesieur HR. Problem gamblers, problem substance users, and dual-problem individuals: an epidemiological study. Am J Public Health 1998; 88(3): 467-70.

Ferris J, Stirpe T, Ialomiteanu A. Gambling in Ontario: A report from a general Population Survey on Gambling-related Problems and Opinions (ARF Research Document series 130). Toronto: Addiction Research Foundation, 1996.

Ferris J, Wynne H. The Canadian problem gambling index: Final report, 2001. Submitted for the Canadian Centre on Substance Abuse. [http://www.cclat.ca/2003%20and%20earlier%20CCSA%20Documents/ccsa-008805-2001.pdf]

Fong T, Kalechstein A, Bernhard B, Rosental R, Rugle L. A double-blind, placebo-controlled trial of olanzapine for the treatment of video poker pathological gamblers. Pharmacol Biochem Behav 2008; 89:298-303.

Gainsbury. S. & Blaszczynski. A. (a). Online Self-guided Interventions for the Treatment of Problem Gambling. International Gambling Studies 2011; 11: 289–308.

Gainsbury. S. & Blaszczynski. A. (b). A systematic review of internet-based therapy for the treatment of addictions, Clinical Psychology Review 2011; 31: 490–498.

Gerstein D, Hoffmann J, Larson C, Engelman L, Murphy S, Palmer A, Chuchro.L, Toce M, Johnson R, Buie T , Hill MA. Gambling impact and behavior study, (Report to The National Gambling Impact Study Commission). Chicago, National Opinion Research Center at the University of Chicago, 1999.

Gossop M, Darke S, Griffths M, Hando J, Powio B, Hall W Starng J. The Severity of Dependence Scale (SDS): psychometric properties of the SDS in English 90: 607–614.

Grant JE, Potenza MN. Tobacco use and pathological gambling. Ann. Clin. Psychiatry 2005; 17(4): 237-241.

Grant JE, Potenza MN, Hollander E et al. Multicenter investigation of the opioid antagonist nalmefene in the treatment of pathological gambling. Am J Psychiatry 2006; 163: 303-312.

Grant JE, Kim SW, Odlaug BL. N-acetyl cysteine, a glutamate-modulating agent, in the treatment of pathological gambling: a pilot study. Biol Psychiatry 2007; 62: 652-657.

Grant JE, Potenza MN. Gender-related differences in individuals seeking treatment for kleptomania. CNS Spectr 2008; 13(3) 235-245.

Grant JE, Kim SW, Hartman BK. A double-blind, placebo-controlled study of the opiate antagonist naltrexone in the treatment of pathological gambling urges. J Clin Psychiatry 2008; 69: 783-789.

Grant JE, Potenza MN, Weinstein A, Gorelick DA. Introduction to behavioral addictions. Am J Drug Alcohol Abuse 2010; 36(5): 233-41.

Grant JE, Odlaug BL, Potenza MN, Hollander E, Kim SW. Nalmefene in the treatment of pathological gambling: multicentre,

double-blind, placebo-controlled study. Br J Psychiatry 2010; 197:330-331.

Grant JE, Chamberlain SR, Schreiber LR, Odlaug BL. Gender-related clinical and neurocognitive differences in individuals seeking treatment for pathological gambling. J Psychiatr Res 2012; 46(9): 1206-11.

Grant JE, Odlaug BL, Mooney ME. Telescoping phenomenon in Pathological Gambling: Association with Gender and Comorbidities. Journal of Nervous & Mental Disease 2012; 200 (11): 996-998.

Grant JE, Odlaug BL, Mooney ME. Telescoping phenomenon in pathological gambling: association with gender and comorbidities. J Nerv Ment Dis 2012; 200(11): 996-8.

Griffiths MD. A "components" model of addiction within a biopsychosocial framework. Journal of Substance Use 2005; 10:191-197.

Griffiths MD. Gambling technologies: Prospects for problem gambling. Journal of Gambling Studies 1999; 15: 265-283.

Gupta R, Dereversky J. Adolescent gambling behavior: a prevalence study and examination of the correlates associated with problem gambling. Journal of Gambling Studies 1998; 14(4): 319-345.

Götestam KG, Johansson A. Characteristics of gambling and problematic gambling in the Norwegian context: a DSM-IV-based telephone interview study. Addict Behav 2003; 28(1): 189-97.

Harper T. Smoking and gambling: a trance inducing ritual. Tob Control 2003; 12(2): 231-3.

Heather N. Problem drinking. Med J Aust 1991 Jan 21; 154 (2): 151.

Hill E, Williams S. Choose six numbers, any six numbers. The Psychologist 1998; 1, 7–20.

Hodgins DC, Wynne H, Makarchuk K. Pathways to recovery from gambling problems: follow-up from a general population survey. Journal of Gambling Studies 1999; 15(2): 93-104.

Hodgins DC, el-Guebaly, N. Natural and treatment-assisted recovery from gambling problems: a comparison of resolved and active gamblers. Addiction 2000; 95:777-789.

Hodgins DC, Schopflocher DP, Martin CR, El-Guebaly N, Casey DM, Currie SR, Smith GJ, Williams RJ. Disordered gambling among higher-frequency gamblers: who is at risk? Psychol Med 2012; 1-12.

Holden C. Behavioral addictions Debut in Proposed DSM-V. Science 2010; 327; 935.

Hopley AA, Nicki RM. Predictive factors of excessive online poker playing. Cyberpsychol Behav Soc Netw 2010;13(4): 379-85.

Ibanez A, Blanco C, Donahue E, Lesieur HR, Perez de Castro I, Fernandez-Piqueras J, et al. Psychiatric comorbidity in pathological gamblers seeking treatment. American Journal of Psychiatry 2001; 158: 1733-1735.

Ibanez A, Blanco C, Moreryra P, Saiz-Ruiz J. Gender differences in pathological gambling. Journal of Clinical Psychiatry 2003; 64: 295-301.

Jaakkola T, Murto A, Pajula, M: Peliklinikan toimintakatsaus 2012 ja Peluurin puolivuotisraportti 2012 [Annual Report of the Gambling Clinic of Helsinki, 2012 and Half Yearly Report of Gamblers Helpline, Peluuri, 2012]. Unpublished Finnish report, 2012 http://www.peluuri.fi/data/liitteet/peliklinikka_toimintakatsaus_2012_pdf.pdf

Jacques C, Ladouceur R, Ferland F. Impact of availability on gambling: a longitudinal study. Can J Psychiatry 2000; Nov: 45(9): 810-5.

Jellinek, EM. Alcoholism, a genus and some of its species. Can Med Assoc J 1960; 24: 83: 1341-5.

Johansson A, Grant JE, Kim SW, Odlaug BL, Götestam KG. Risk factors for problematic gambling: A critical literature review. Journal of Gambling Studies 2009; 25: 67-92.

Kausch O. Patterns of substance abuse among treatment-seeking pathological gamblers. J Subst Abuse Treat 2003; 25(4): 263-70.

Kessler RC, Hwang I, LaBrie R, Petukhova M, Sampson NA, Winters KC, Shaffer HJ. DSM-IV pathological gambling in the National Comorbidity Survey Replication. Psychol Med. 2008; 38(9): 1351-60.

Kim SW, Grant JE, Adison DE, Shin YC.Double-blind naltrexone and placebo comparison study in the treatment of pathological gambling 2001; 49: 914-921.

Korn DA, Shaffer HJ. Gambling and the Health of the Public: Adopting a Public Health Perspective. Journal of Gambling Studies 1999; 15(4): 289-365.

Ladd GT, Petry NM. Gender differences among pathological gamblers seeking treatment. Exper Clinical Psychopharmacol 2002; 10: 302-309.

Ladouceur R, Walker M. A cognitive perspective on gambling. In P.M. Salkovskis (Ed.) Trends in Cognitive and

Behavioural Therapies, p. 89-120. New York; John Wiley and Sons, 1996.

Ladouceur R, Boudreault N, Jacques C, Vitaro F. Pathological gambling and related problems among adolescents. Journal of Child and Adolescent Substance Abuse 1999; 8: 55-68.

Ladouceur R, Bouchard C, Rheaume N, Jacques C, Feland F, Leblond J, Walker M. Is the SIGS an accurate measure of pathological gambling among children, adolescents and adults? Journal of Gambling Studies 2000; 16(1): 1-24.

Ladouceur R, Sylvain C, Boutin C, Lachance S, Doucet C, Leblond J, Jacques C. Cognitive treatment of pathological gambling. J Nerv Ment Dis 2001; 189(11): 774-80.

Ladouceur R, Sylvain, C, Boutin, C, Doucet C. Understanding and treating pathological gamblers. London: Wiley. 2002.

Ladouceur R, Sylvain C, Boutin C, Lachance S, Doucet C, Leblond J. Group therapy for pathological gamblers: a cognitive approach. Behaviour research and therapy 2003; 41(5): 587-596.

Ladouceur. R. Gambling the hidden addiction. The Canadian Journal of Psychiatry 2004; 49: 501–503.

Ladouceur R, Lachance S. Overcoming Pathological Gambling. Therapist guide. N.Y.: Oxford University Press. 2007.

Lahti T, Halme J, Pankakoski M, Sinclair D, Alho H: Characteristics of treatment seeking Finnish pathological gamblers: baseline data from a treatment study. International Journal of Mental Health and Addiction 2012a; 21 doi: 10.1007/s11469-012-9411-4

Lahti T, Castren S, Tenhola H, Heinälä P, Alho H. Rahapeliriippuvuutta voidaan hoitaa [Pathological gambling can be treated]. Suomen Lääkärilehti 2012b; 6 (67): 413-416.

Lahti T, Halme J, Pankakoski M, Sinclair D, Alho H. Characteristics of treatment seeking Finnish pathological gamblers: baseline data from a treatment study. International Journal of Mental Health and Addiction 2013; 11(3): 307-314.

Langer EJ. "The Illusion of Control", Journal of Personality and Social Psychology 1975; 32 (2): 311–328.

Lesieur HR, Blume SB. The South Oaks Gambling Screen (SOGS) A new instrument for the identification of pathological gamblers. American Journal of Psychiatry 1987; 144(9): 1184-88.

Lorains FK, Colishaw S, Thomas SA. Prevalence of comorbid disorders in problem and pathological gambling: systematic review and meta-analysis of population surveys. Addiction 2011; 106: 490-498.

Lund I. Lessons from the Grey Area: A Closer Inspection of At-risk Gamblers. Journal of Gambling Studies 2007; 23:409–19.

Lyk-Jensen SV. New evidence from the grey area: Danish results for at-risk gambling. Journal of Gambling Studies 2010; 26 (3): 455-67.

Martins SS, Tavares H, da Silva Lobo D S, Galetti AM, Gentil V. Pathological gambling gender, and risk-taking behavior. Addictive Behavior 2004; 29: 1231–1235.

Marshall D. Gambling as a public health issue: The critical role of the local environment. Journal of Gambling Issues 2009; 66–80.

Marshall K, Wynne H. Against the odds: a profile of at-risk and problem gamblers. Canadian Social Trends 2004; 73: 25-29.

McCormack A, Shorter GW, Griffiths MD. An Empirical Study of Gender Differences in Online Gambling. J Gambl Stud. 2012. [Epub ahead of print]

McCready J, Mann R, Zhao J, Eves R. Correlates of gambling-related problems among older adults in Ontario. Journal of Gambling Issues; 2008: 22: 174-194.

McElroy SL, Nelson EB, Welge JA, Keck PE Jr. Olanzapine in the treatment of pathological gambling: a negative randomized placebo-controlled trial. J Clin Psychiatry 2008; 69: 433-440.

McGrath DS, Barrett SP. The comorbidity of tobacco smoking and gambling: a review of the literature. Drug Alcohol Rev 2009; 28(6): 676-81.

McMillen J, Wenzel M. Measuring problem gambling: Assessment of three prevalence screens. International Gambling Studies 2006; 5(1): 57-61.

McNeilly DP, Burke WJ. Late life gambling: The attitudes and behaviours of older adults. Journal of gambling Studies 2000; 16(4): 393-415.

Meyer G, Hayer T, Griffiths M. Editors. Problem gambling in Europe. NY: Springer, 2009.

Miller WR. Motivational Interviewing with problem drinkers. Behavioural Psychotherapy 1983; 11:147-172.

Miller W, Rollnick S. Motivational Interviewing: Preparing people for change. 2nd ed. New York: Guilford Press, 2002.

Monaghan S, Blaszczynski, A. (a). Internet-based interventions for treatment of

problem gambling. Toronto : Centre for Addiction and Mental Health, 2009.

Monaghan S, Blaszczynski A. (b). Internet therapy for problem gambling: A Literature review and environmental scan. Final report prepared for Ontario Problem Gambling Research Centre, Guelph, Ontario, Canada, 2009.

Montgomery SA, Åsberg M. A new depression scale designed to be sensitive to change. The British Journal of Psychiatry 1979; 134: 382–9.

Morasco BJ, Von Eigen KA, Petry NM. Severity of gambling is associated with physical and emotional health in urban primary care patients. Gen Hosp Psychiatry 2006; 28(2): 94-100.

Morasco BJ, Pietrzak RH, Blanco C, Grant BF, Hasin D, Petry NM. Health problems and medical utilization associated with gambling disorders: results from the National Epidemiologic Survey on Alcohol and Related Conditions. Psychosom Med 2006; 68(6):976-84.

Mosby, Inc. (2009). Mosby's dictionary of medicine, nursing & health professions. St. Louis, Mo: Mosby/Elsevier.

Murray V, Ladouceur R, Jacques C. Classification of gamblers according to the NODS and a clinical interview. International Gambling Studies 2005; 5(1): 57-61.

Murto, A. (2012). Kun ajat on kovat – perustetaan kasino. (When times are challenging – RAY decides to build a new casino). National Institute for Health and Welfare – Information about Gambling. https://blogi.thl.fi/web/poreilua/etusivu?p_p_id=33&p_p_lifecycle=0&p_p_state=normal&p_p_mode=view&p_p_col_id=column1&p_p_col_count=1&p_r_p_564233524_tag=pelihaitat

National Research Council. Pathological gambling: a critical review. Washington D.C.: National Academy Press; 1999.

NRC National Research Council. Pathological Gambling: A Critical Review. Washington, D.C.: National Academy Press, 1999.

Odlaug BL, Stinchfield R, Golberstein E, Grant JE. The Relationship of Tobacco Use With Gambling Problem Severity and Gambling Treatment Outcome. Psychol Addict Behav 2012a Sep 3. [Epub ahead of print]

Odlaug BL, Schreiber LR, Grant JE. Personality disorders and dimensions in pathological gambling. J Pers Disord 2012b Jun; 26(3):381-92.

Oxford English Dictionary. 11th ed. Oxford: Oxford Press, 2008.

Pallesen S, Mitsem M, Kvale G, Johnsen BH, Molde H. Outcome of psychological treatments of pathological gambling: a review and meta-analysis. Addiction 2005; 100(10): 1412-22.

Pallesen S, Molde H, Arnestad HM, et al. Outcome of pharmacological treatments of pathological gambling: a review and meta-analysis. J Clin Pharmachol 2007; 27: 357-364.

Pajula M, Aaltonen A. Peluuri Vuosiraportti 2010 [Annual Report of Gamblers Help Line, 2010]. Unpublished Finnish report 2010.

Pajula M, Vuorento H, Aaltonen A. Peluuri Vuosiraportti 2011 [Annual Report of Gamblers Help Line, 2011]. Unpublished Finnish report 2011.

Park S, Cho M, Jeon H, Lee HW, Bae JN, Park JL et al. Prevalence, clinical correlations, comorbidities, and suicidal tendencies in pathological Korean gamblers: results from the Korean Epidemiologic Catchment Area Study. Soc Psychiatr Epidemiol 2010; 45: 621-629.

Parke J, Griffiths MD. The psychology of the fruit machine: The role of structural characteristics (revisited). International Journal of Mental Health and Addiction 2006; 4: 151-179.

Parke J, Griffiths MD. The role of structural characteristics in gambling. In G. Smith, D.C. Hodgins & R.J. Williams (Eds.). research and measurement issues in gambling studies (pp. 217-249). Amsterdam: Elsevier, 2007.

Petry NM. Psychiatric symptoms in problem gambling and non-problem gambling substance abusers. Am J Addict 2000; 9(2): 163-71.

Petry NM, Oncken C. Cigarette smoking is associated with increased severity of gambling problems in treatment-seeking gamblers. Addiction 2002; 97:745-753.

Petry NM, Stinson FS, Grant BF. Comorbidity of DSM-IV pathological gambling and other psychiatric disorders: Results from the National Epidemiologic Survey on Alcohol and Related Conditions. Journal of Clinical Psychiatry 2005; 66: 564-574.

Petry NM. Pathological gambling. Etiology, comorbidity, and treatment. American Psychological Association. Washington D.C., 2005.

Petry NM, Ammerman Y, Bohl J, Doersch A, Gay H, Kadden R, Molina C, Steinberg K. Cognitive-behavioral therapy for

pathological gamblers. J Consult Clin Psychol 2006; 74(3): 555-67.

PGRTC Problem Gambling Research and Treatment Centre (PGRTC). Guideline, assessment and treatment in problem gambling. Monash University: Clayton, 2011.

Phillips D. Gambling: The hidden addiction. Behavioural health Management 2005; 25(5): 32-37.

Potenza MN, Kosten TR, Rounsaville BJ. Pathological gambling. JAMA 2001; 11: 286(2): 141-4.

Potenza MN, Steinberg MA, McLaughlin SD, Wu R, Rounsaville BJ, Krishnan-Sarin S, George TP, O'Malley SS. Characteristics of tobacco-smoking problem gamblers calling a gambling helpline. American Journal of Addiction 2004; 13(5): 471-493.

Potenza MN, Steinberg MA, Wu R, Rounsaville BJ, O'malley SS. Characteristics of Older Adult Problem Gamblers Calling a Gambling Helpline. Journal of Gambling Studies 2006; 22: 241–254.

Productivity Commission Gambling: Final report. Canberra: Government of Australia, 2010.

Randall CL, Roberts JS, Del Boca FK, Carroll KM, Connors GJ, Mattson ME. Telescoping of landmark events associated with drinking: A gender comparison. Journal of Studies on Alcohol 1999; 60: 252–260.

Rash CJ, Weinstock J, Petry NM. Drinking patterns of pathological gamblers before, during, and after gambling treatment. Psychol Addict Behav 2011; 25(4): 664-74.

Rollnick S, Gobat N. Motivational interviewing: Introduction and integration workshop. Cardiff October, 2010.

Rush B, Veldhuizen S, Adlaf E. Mapping the prevalence of problem gambling and its association with treatment accessibility and proximity to gambling venues. Journal of Gambling Issues 2007; 20:193-213.

Séguin M, Boyer R, Lesage A, McGirr A, Suissa A, Tousignant M, Turecki G. Suicide and gambling: psychopathology and treatment-seeking. Psychol Addict Behav 2010; 24(3): 541-7.

Seppä K: Potilaan haastatteleminen: kolmen kysymyksen AUDIT-C [Interviewing a patient: three question AUDIT-C] Suomen lääkäriseura [Finish Association of Medical Doctors], Duodecim 2010. http://www.kaypahoito.fi/web/kh/suositukset/naytaartikkeli/.../nak04611

Sévigny S, Ladouceur R, Jacques C, Cantinotti M. Links between casino proximity and gambling participation, expenditure, and pathology. Psychol Addict Behav 2008; 22(2): 295-301.

Shaffer HJ, Hall MN, Vander Bilt J. Estimating the Prevalence of Disordered Gambling Behaviour in the United States and Canada: A Meta-Analysis. Boston, MA: Presidents & Fellows of Harvard Coll. 1997.

Shaffer HJ, Hall MN, Vander Bilt J. Estimating the prevalence of disordered gambling behavior in the United States and Canada: a research synthesis. American Journal of Public Health 1999; 89, (9): 1369-1376.

Shaffer HJ, Hall MN. Updating and Refining Prevalence Estimates of Disordered Gambling Behavior in the United States and Canada. Canadian Journal of Public Health 2001; 92(3): 168-172.

Shaffer HJ, Freed CR, Healea D. Gambling disorders among homeless persons with substance use disorders seeking treatment at a community center. Psychiatr Serv 2002; 53(9): 1112-7.

Shaffer HJ, LaPlante DA, LaBrie RA, Kidman R, Donato A, Stanton M. Toward a syndrome model of addiction: multiple expressions, common etiology. Harvard Review of Psychiatry 2004; 12:367-374.

Shaffer HJ, Korn DA. Gambling and related mental disorders: a public health analysis. Annu Rev Public Health 2002; 23: 171-212.

Shaffer HJ, LaBrie RA, LaPlante D. Laying the foundation for quantifying regional exposure to social phenomena: considering the case of legalized gambling as a public health toxin. Psychol Addict Behav 2004; 18 (1): 40-8.

Shaffer HJ, Martin R. Disordered Gambling: Etiology, Trajectory, and Clinical Considerations. Annual Review of Clinical Psychology 2011; 7: 483-510.

Shaw MC, Forbush KT, Schlinder J, Rosenman E, Black DW. The effect of pathological gambling on families, marriages, and children. CNS Spectr 2007; 12(8): 615-22.

Slutske WS. Natural recovery and treatment-seeking in pathological gambling: Results of two U.S. national surveys. American Journal of Psychiatry 2006; 163 (2): 297-302.

Slutske WS, Blaszczynski A, Martin NG. Sex differences in the rates of recovery, treatment-seeking, and natural recovery

in pathological gambling: results from an Australian community-based twin survey. Twin Res Hum Genet 2009;12(5): 425-32.

Smart RG, Ferris J. Alcohol, drugs and gambling in the Ontario adult population, 1994. Can J Psychiatry 1996; 41(1): 36-45.

Sproston K, Erens B, Orford J. The future of gambling in Britain. BMJ 2000; 18: 321(7271): 1291-2.

Spunt B, Dupont I, Lesieur H, Liberty HJ, Hunt D. Pathological gambling and substance misuse: a review of the literature. Subst Use Misuse 1998; 33(13): 2535-60.

Stinchfield R, Winters KC. Gambling and problem gambling among youths. Annals of the American academy of Political and social Science 1998; 556:172-185.

Strong DR, Kahler CW. Evaluation of the continuum of gambling problems using the DSM-IV. Addiction 2007; 102: 713-721.

Suurvali H, Hodgins DC, Cunningham JA. Motivators for resolving or seeking help for gambling problems: A review of the empirical literature. Journal of Gambling Studies 2010; 26: (1): 1-33.

Sylvain C, Ladouceur R, Boisvert JM. Cognitive and behavioral treatment of pathological gambling: a controlled study. J Consult Clin Psychol 1997; 65(5): 727-32.

Tavares H, Zilberman ML, Bites FJ, Gentil V. Gender differences in gambling progression. Journal of gambling Studies 2001; 17: 151-159.

Toneatto. T, Bliz-Miller T, Calderwwod K, Dragonetti R, Tsanos A. Cognitive distortions in heavy gambling. Journal of Gambling Studies 1997; 33: 253–266.

Toneatto T. Cognitive psychopathology of problem gambling. Subst Use Misuse 1999; (11): 1593-604.

Toneatto T, Ladoceur R. Treatment of pathological gambling: a critical review of the literature. Psychol Addict Behav 2003;17(4): 284-92.

Toneatto T & Nguyen L: Individual characteristics and problem gambling behavior. In: Smith G. Hodgins DC, Williams, RJ eds. Research and measurements Issues in Gambling Studies. San Diego, CA: Academic Press 2007; 279-03

Tourangeau R, Smit TW. Asking sensitive questions: The impact of data collection mode, question format, and question context. Public Opinion Quarterly 1996; 60: 275-304.

Turja T, Halme J, Mervola M, Jarvinen-Tassopoulous J, Ronkainen JE: Suomalaisten rahapelaaminen 2011 [Finnish Gambling 2011]. National Institute for Health and Welfare (THL). Report 14/2012: Helsinki.

Trevorrow K, Moore S. The Association Between Loneliness, Social Isolation and Women's Electronic Gaming Machine Gambling. Journal of Gambling Studies 1998; 14: 263-84.

Unwin BK, Davis MK, De Leeuw JB. Pathologic gambling. Am Fam Physician 2000; 61(3): 741-9.

Van der Heijden PGM, Van Gils G, Bouts J, Hox JJ. A comparison of randomized response, computer assisted interview, and face-to-face direct questioning: Eliciting sensitive information in the context of welfare and unemployment benefit. Sociological Methods and Research 2000; 28: 505-537.

Veit CT, Ware JE. The structure of psychological distress and well-being in general populations. Journal of Consulting and Clinical Psychology 1983; 51: 730-42.

Vitaro F, Arsenault L, Tremblay RE. Impulsivity predicts problem gambling in low SES adolescent males. Addiction 1999; 94:565-575.

Vitaro F, Wanner B, Ladouceur R, Brendgen M, Tremblay RE. Trajectories of gambling during adolescence. Journal of Gambling Studies 2004;20(1): 47-69.

Volberg RA, Banks SM. ' A review of two measures of pathological gambling in the United States'. Journal of Gambling Behavior 1990; 6(2): 153-163.

Volberg RA, Boles J. Gambling and Problem Gambling in Georgia. Report to the Georgia Department of Human Resources. Roaring Spring, pa: Gemini Research. 1995.

Volberg RA, Abbott MW, Rönnberg S, Munck IM. 'Prevalence and risks of pathological gambling in Sweden' Acta Psychitrica Scandinavca 2001; 104(4): 250-256.

Walker MB, Dickerson MG. 'The prevalence of problem and pathological gambling: A critical analysis'. Journal of Gambling Studies 1996; 12(2): 233-249.

Wardle H, Keily R, Astbury G, Reith G. Risky Places?': Mapping Gambling Machine Density and Socio-Economic Deprivation. J Gambl Stud 2012. [Epub ahead of print].

Warpenius K, Holmila M , Raitasalo K. Peliin ei puututa. Alkoholin, tupakan ja

rahapeliautomaattien ikärajavalvontaa testanneet ostokokeet vähittäisliikkeissä. (Enforcing age limits on purchases of alcohol and tobacco and the use of slot machines: test purchases in retail outlets). Yhteiskuntapolitiikka 2012; 77: 4: 375-85.

Welte J, Barnes G, Wieczorek W, Tidwell MC, Parker J. Alcohol and gambling pathology among U.S. adults: prevalence, demographic patterns and comorbidity. J Stud Alcohol 2001; 62(5): 706-12.

Welte J, Barnes GM, Wieczorek WF, Tidwell MC, Parker J. (2002). Gambling participation in the U.S. Results from a national survey. Journal of Gambling Studies 2002; 18(4): 313–337.

Welte JW, Barnes GM, Hoffman JH. Gambling, substance use and other problem behaviours among youth: A test of general deviance models. Journal of Criminal Justice 2004; 32: 297-306. 2004.

Welte J, Barnes G, Tidwell M & Hoffman J. The prevalence of problem gambling among U.S. adolescents and young adults: results from a national survey. Journal of Gambling Studies 2008; 24: 199-33.

Wiebe J, Kostyk D. Exploring the meaning of Senior Problem Gambling. Paper presented at annual Canadian Foundation on Compulsive Gambling Conference, Niagra Falls, 2000.

Williams RJ, Royston J, Hagen B. Gambling and problem gambling within forensic populations: A review of the literature. Criminal Justice and Behavior: an International Journal 2005; 32: 665-689.

Williams RJ, Volberg RA & Stevens RMG: The population Prevalence of Problem Gambling: Methodological Influences, Standardized Rates, Jurisdictional Differences, and Worldwide Trends. Report prepared for the Ontario Problem Gambling Research Centre and the Ontario Ministry of Health and Long Term Care. May 8, 2012.

Yu EC, Lagnado DA. The influence of initial beliefs on judgments of probability. Front Psychol 2012; 3: 381.

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An analysis of problem gambling among the Finnish working-age population: a population survey

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Abstract

Background: Gambling problems currently affect approximately 100 000 Finns. In order to prevent and reduce gambling-related harms it is crucial for the Finnish public health authorities to gain a stronger understanding of the association between gambling problems and related socio-demographic factors, other commonly co-occurring dependencies (e.g. alcohol and nicotine) and the type of games gambled. In this article the prevalence of problem gambling in Finland and the socio-demographic profiles of problem gamblers are studied.

Method: An annual postal survey entitled Health Behaviour and Health among the Finnish Adult Population AVTK was sent to a random sample of Finnish adults (N=5000) aged between 15 and 64. The sample was derived from the Finnish Population Register. The survey was mailed to the participants in April 2010. Gender differences in socio-demographic variables and Problem Gambling Severity Index PGSI were assessed. A multinomial regression model was created in order to explore the association between socio-demographic factors and the severity of gambling.

Results: A total of 2826 individuals (1243 males and 1583 females) replied to the survey. Of the respondents, 1.1% (2.1% of males, 0.3% of females) were identified as problem gamblers. Those who were of younger age, gender, had less than twelve years of education, consumed alcohol at risk level and smoked had higher odds of having low or moderate levels of gambling problems. Whereas, unemployment and smoking predicted significantly for problem gambling. Females gambled Lotto and slot machines less frequently than males and had more low level gambling problems. Males gambled more with a higher frequency and had a more severe level of gambling problems. Females were more attracted to scratch card gambling and daily Keno lotteries compared to males. In comparison, males gambled more on internet poker sites than females. Overall, a high frequency of gambling in Lotto, daily lotteries, slot machines, horse race betting and internet gambling was significantly associated with a more severe level of problem gambling.

Conclusion: Gambling problems affect tens of thousands of individuals annually, therefore certain vulnerabilities should be noted. Comorbid dependencies, smoking in particular, ought to be screened for and recognised in the public health sector. Regulating the availability of slot machine gambling and enforcement of the age limit should be acknowledged. In establishing new gambling venues, prevalence rates in those particular areas should be actively monitored.

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Background

Many people gamble as a leisure activity, though for some it turns out not to be a leisure with pleasure. Gambling problems cause severe negative consequences. A DSM-IV (Diagnostic and Statistical Manual of Mental Disorders) diagnosis for pathological gambling (PG) requires 'persistent and maladaptive gambling behaviour', as indicated by at least five of ten symptoms that are similar in content to the symptoms of substance abuse [1]. Problem gambling is a milder form of gambling and is indicated by at least three of the ten DSM-IV-TR diagnostic criteria [2]. Recent analysis by Williams, Volberg and Stevens [3] concluded that the standardized past-year problem gambling [1] prevalence ranged from 0.5% to 7.6% with the average rate across all countries being 2.3%. According to their comprehensive report the lowest prevalence rates for problem gambling are in Europe, intermediate rates in North America and Australia and the highest in Asia. The current problem gambling[1] rate in Finland is 2.7% [4].

To date there have only been three Finnish Gambling Prevalence Surveys [4-6]. The latest survey from 2011 revealed that 78% of the Finns had gambled over the past year, the most popular gambling activity being National Lottery (i.e. Lotto) with more than half of the Finnish population having gambled Lotto (74%). The next most popular game was scratch cards (37%) followed by slot machine gambling. Internet games (national and international) attracted 1% of the Finns.

A vast body of research has found that certain socio-demographic characteristics are associated with the development of gambling problems. Explicitly, younger age, male gender and socio-economic status (e.g. lower level of education, unemployment, marital status) are associated with gambling problems [7-11].

Gambling problems often co-occur with substance abuse and nicotine dependence. Lorains et al. [12] meta-analysis of comorbid disorders in pathological and problem gambling revealed that the weighted mean effect size for substance use disorders was 57.%, for alcohol use disorder 17.2% and 60.1% for nicotine dependence.

The availability and acceptability of legalized gambling has increased expansively over the past decades as noted by Lyk-Jensen [13]. This development has the potential to increase the prevalence of gambling problems. In addition to the availability of games, the types of games gambled also influence the development of gambling problems [14]. Globally, the utmost problems are associated with EMG's, known as slot machines [14,15]. The same trend is seen in Finland: Finnish Gambling Clinic's and Finnish Gambling Help Line – Peluuri's annual reports [16] show that slot machine gambling is the most troubling type of game for help-seeking problem gamblers. In Finland there are unique opportunities to gamble, as slot machines, about 20 000 units, are freely dispersed in kiosks, restaurants, grocery stores, fuel stations and shopping centres. Availability, accessibility and acceptability of gambling is most likely to have a great impact on the overall gambling prevalence of the Finns.

Our aims were to investigate the prevalence of problem gambling in the adult sample in Finland, and to describe socio-demographic characteristics, alcohol consumption and nicotine dependency on different severity levels of gambling, and to also investigate types and frequency of games gambled among the adult population.

Methods

Recruitment

During April to June 2010, a total of 2826 individuals (1243 males and 1583 females) replied to the survey. An annual postal survey, entitled Health Behaviour and Health among the Finnish Adult Population (AVTK), was sent to a random sample of Finnish adults (N=5000) aged between 15 and 64. The sample was derived from the Finnish Population Register. The survey was mailed to the participants in April 2010. A total of three reminders were sent until June if the participants did not return the survey. Participants sent their replies by pre-paid mail. The primary purpose of the AVTK survey was to obtain information about current health-related behaviours of working-age Finns, and about long- and short-term changes in health-related behaviours among this population. The survey examined key aspects of health-related behaviours including: smoking, dietary habits, alcohol consumption and physical activity. Two sections of gambling-related questions were included in the survey. (Finnish report: http://urn.fi/URN:NBN:fi-fe201205085393).

Note: In 2008, for the first time in the history of the AVTK survey, gambling related-questions were included. Results of the year 2008 were published in Finnish [17]. The 2010 AVTK Health Survey results [18]. Analysis with gambling-related questions in 2010 presented here. The gambling-related questions of the 2011 [19] (in appropriate brackets) have not yet been analysed.

The study received ethics clearance from the Ethics Committee of the National Institute for Health and Welfare, Helsinki. Document number: THL/220/6.02.00/2010:§151/2010.

Measures

For this study, we analysed the following sections of the AVTK survey: 1) Socio-demographic data, and 2) Finnish translation of the Problem Gambling Severity Index (PGSI), [20] where the sum of 9 items was computed, maximum points being 27, using a 4-point Likert scale with 0 = never, to 3 = almost always. Cronbach's alpha was 0.79. The scoring of the PGSI is as follows: a) 0 = non-problem gambling, b) 1 or 2 = low level of gambling with few or no

identified negative consequences (here considered to be low level gambling), c) 3 to 7 = moderate level of gambling leading to some negative consequences (here considered to be moderate level gambling) and d) 8 or more = problem gambling with negative consequences and a possible loss of control (here considered to be problem gambling). 3) The type of gambling was assessed by presenting 10 main types of gambling and frequency of gambling. The participants were asked to choose on what type of gambling they gambled. Gambling types were: a) Lotto and Viking lotto, b) daily Keno lotteries, c) slot machines, d) scratch cards, e) sports betting, f) horse race betting and g) internet poker via both PAF (Åland Slot Machine Association) and other international internet gambling sites. Frequency of gambling was measured using a 5-point Likert scale: not at all, less than once a week, 1–2 days per week, 3–5 days per week, 6–7 days per week. For gender and general comparisons responses were classified into two classes with regards to the frequency of gambling: less than once a week, and at least once a week. 4) Two questions of alcohol use: a) overall alcohol consumption: 'During the past 12 months, have you consumed any alcohol?' Yes/No answers, b) risk-level of alcohol consumption: 'How often do you drink six or more units of alcohol?' (One unit: 1/3 litre beer or cider, 12 cl wine, 8 cl strong wine, 4 cl strong alcohol), with a 6-point Likert scale where 1 = daily, 2 = 2–3 times per week, 3 = once a week, 4 = 2–3 times per month, 5 = couple of times per year or less, 6 = never. Risk-level alcohol consumption is defined as at least 6 units once a week. (Only question b) was used in the analyses, being a more accurate variable). 5) Nicotine dependency by asking smoking frequency: 'Do you smoke at the moment (cigarettes, pipe or cigars)?' with a 3-point Likert scale where 1 = yes, daily, 2 = once in a while, 3 = not at all.

Participants

There were more females (56%) than males in this sample. The mean age of the respondents was 42.9 years (SD = 14.4). 36.6% of respondents were 51–65 years old, 24.2% were 26–40 years old, 22.5% were 41–50 years old and 16.4% were 16–25 years old. With regard to marital status, 65.3% of the respondents were married, 24.5% single, 8.5% divorced or separated and 1.3% widowed. The employment status of respondents was as follows: 62.1% employed, 2.4% partially employed or retired, 0.5% laid off, 5.7% unemployed, 13.7% students, 3.3% homemakers (stay-at-home mother or father), 0.7% on sick leave, 10.5% pensioned and 0.9% unemployed for any other reason. The response rate was 57%.

Statistics

Gender differences in socio-demographic factors, frequency of gambling and PGSI were assessed using t-tests for continuous data and Chi square tests for categorical data. A multinomial regression model was created to explore the association between socio-demographic variables and the level of gambling severity (PGSI). Different severity levels of gambling were compared to the non-problem gambling group which served as the reference category. The statistical program SPSS (version 18) was used for the analyses.

Results

Socio-demographic characteristics and gender differences of the participants

Age and gender

The age difference between females (M = 42.3, SD = 14.4) and males (M = 43.6, SD = 14.32) was small but statistically significant (t (2824) = 2.40, p = 0.017). However, because of the large sample size, these kind of small and trivial differences often appear to be significant.

Marital status

As many as 60% of the respondents reporting the most severe forms of gambling problems were separated or divorced ($\chi2(9, 2727) = 24.1$, p = 0.004). The severity of gambling problems was also compared with marital status, with 67.3% of those respondents with no gambling problems being married or cohabiting. Single status respondents had the highest percentage in both the low (17.5%) and moderate levels (6.9%) of gambling problems.

Education and employment

Females were significantly more educated than males in this sample ($\chi2$ (1, 2727) = 52.94, p < 0.001) (Table 1). With regards to unemployment there were no significant differences between men and women ($\chi2$ (1, 2821) = 0.87, p = 0.35) (Table 1).

Comorbid alcohol consumption and nicotine dependency (smoking)

Risk-level alcohol consumption was greater among males compared to females ($\chi2$ (1, 2760) = 138.15, p < 0.001). Gender differences in smoking were also significant, indicating that males smoked more than females ($\chi2$ (1, 2789) = 24.20, p < 0.001) (Table 1).

Prevalence and gender differences in severity of gambling

Of all respondents, a total of 1.1% were problem gamblers (8 or more points on the PGSI scale), with 5.5% of the respondents experiencing moderate levels of gambling problems. According to our results, males suffered from more severe forms of problem gambling than females. Specifically, gender differences in all three PGSI categories were significant as follows: for low level (males = 88.9%, females = 97%), for moderate level (males = 9.0%, females = 2.6%) and for problem gambling level (males =

Table 1 Gender differences in education, employment, alcohol consumption and smoking

Measure	Gender				Chi-square test
	F		M		
	N	(%)	N	(%)	
Education (yrs)					$\chi2$ (1, 2784) = 52.94, p < 0.001
< 12 yrs	595	(38.2)	639	(52.0)	
> 12 yrs	961	(61.8)	589	(48.0)	
Employment					$\chi2$ (1, 2821) = 0.87, p = 0.35
Employed	1495	(94.6)	1164	(93.8)	
Unemployed	85	(5.4)	77	(6.2)	
Alcohol consumption[a]					$\chi2$ (1, 2760) = 138.15, p < 0.001
Non-risk level	1426	(92.0)	918	(75.9)	
Risk level	124	(8.0)	292	(24.1)	
Nicotine dependency (smoking)					$\chi2$ (1, 2789) = 24.20, p < 0.001
Daily	248	(15.9)	288	(23.3)	
Occasionally / not at all	1307	(84.1)	946	(76.7)	

[a] Risk-level alcohol consumption is defined as consuming at least 6 units of alcohol at least once a week.

2.1%, females = 0.3%) ($\chi2$ (2, 2738) = 73.47, p < 0.001) (Table 2).

Type of games and the frequencies gambled

The most common form of gambling was lotto, reported to have been played by 56.4% of the respondents. Other popular game types were scratch cards (25.9%) and slot machine gambling (23.8%). Scratch card gambling was the only game type which was more popular among females (27.3%) than males (24.0%). In comparison, males favoured game types such as sports betting (14.1% males, 1.5% females), horse race betting (5.7% males, 1.7% females) and internet poker sites (5.4% males, 0.5% females).

Most of the game types were more frequently gambled by men compared to women. When examining only people who reported at least some degree of gambling activity, differences in the frequency of gambling exist in the following game types: lotto ($\chi2$ (1576, 1) = 21.5, $p < 0.001$), slot machines ($\chi2$ (649, 1) = 11.3, p = 0.001), sports betting ($\chi2$ (190, 1) = 7.5, p = 0.006) and horse race betting ($\chi2$ (94, 1) = 5.0, p = 0.03).

Frequency of gambling and the severity level of gambling

Table 3 shows types of gambling and the frequency of each game type gambled, less than once a week and at least once a week, within different levels of PGSI. Only subjects who reported at least some amount of gambling are included in the results. Type of games gambled are presented from highest to lowest frequencies.

Lotto and daily lotteries

Lotto was the most frequently gambled game in this sample with 53.5% of the respondents having gambled lotto less than once a week, and 46.5% gambled at least once a week. Daily lotteries were gambled by 53.7% of repondents less than once a week, and 46.3% gambled at least once a week. The frequency of lotto and daily lotteries betting was associated with gambling severity ($\chi2$ (2, 1565) = 24.4, p <0.001 and ($\chi2$ (2, 391) = 19.57, p < 0.001). That is, subjects with more severe gambling problems gambled these games more frequently compared to those with only low level problems or no gambling problems.

Slot machine gambling

Slot machine gambling attracted 26.9% of the respondents to gamble at least once a week and 73.1% gambled it less than once a week. Frequent slot machine gambling was associated with more severe gambling problems ($\chi2$ (2, 647) = 52.57, p < 0.001).

Table 2 Gender differences in severity level of gambling

Gender	PGSI level					Chi-square test
	No problem	Low	Moderate	Problem gambling	Total	
	N (%)	N (%)	N (%)	N (%)	N (%)	
Male	836 (68.6)	248 (20.3)	110 (9.0)	25 (2.1)	1219 (44,5)	$\chi2$ (3,2738) = 154.24, p < 0.001
Female	1329 (87.5)	145 (9.5)	40 (2.6)	5 (0.3)	1519 (55.5)	
Total	2165 (79.1)	393 (14.4)	150 (5.5)	30 (1.1)	2738 (100)	

Table 3 Type of games, frequency of gambling and the severity level of gambling

Type of game	Frequency	PGSI level[a]			Total
		Low or no problem	Moderate	Problem gambling	
		N (%)	N (%)	N (%)	N (%)
1. Lotto***	< once a week	795 (55.3)	36 (34.3)	6 (26.1)	837 (53.5)
	≥ once a week	642 (44.7)	69 (65.7)	17 (73.9)	728 (46.5)
	Total	1437 (100)	105 (100)	23 (100)	1565 (100)
2. Daily lotteries***	< once a week	188 (58.9)	18 (32.1)	4 (25.0)	210 (53.7)
	≥ once a week	131 (41.1)	38 (67.9)	12 (75.0)	181 (46.3)
	Total	319 (100)	56 (100)	16 (100)	391 (100)
3.Slot machine***	< once a week	412 (79.4)	50 (47.6)	11 (47.8)	473 (73.1)
	≥ once a week	107 (20.6)	55 (52.4)	12 (52.2)	174 (26.9)
	Total	519 (100)	105 (100)	23 (100)	647 (100)
4. Scratch cards#	< once a week	581 (92.7)	58 (87.9)	10 (83.3)	649 (92.1)
	≥ once a week	46 (7.3)	8 (12.1)	2 (16.7)	56 (7.9)
	Total	627 (100)	66 (100)	12 (100)	705 (100)
5. Sports Betting#	< once a week	103 (74.1)	24 (72.2)	9 (50)	136 (71.6)
	≥ once a week	36 (25.9)	9 (27.3)	9 (50)	54 (28.4)
	Total	139 (100)	33 (100)	18 (100)	190 (100)
6. Horse race Betting*	< once a week	49 (75.4)	10 (52.6)	4 (40.0)	63 (67.0)
	≥ once a week	16 (24.6)	9 (47.4)	6 (60.0)	31 (33.0)
	Total	65 (100)	19 (100)	10 (100)	94 (100)
7. Internet gambling**	< once a week	35 (81.4)	10 (47.6)	3 (37.5)	48 (66.7)
	≥ once a week	8 (16.8)	11 (52.4)	5 (62.5)	24 (33.3)
	Total	43 (100)	21 (100)	8 (100)	72 (100)

Note: Not Significant: #; Significant: *<0.05, **<0.01, ***<0.001.
[a] No problem gambling included in low level of gambling problems.
Only subjects who reported at least some amount of gambling were included in the table.

Scratch cards

Scratch cards attracted 7.9% of respondents at least once a week and 92.1% gambled it less than once a week. The frequency of scratch card gambling was not associated with gambling severity ($\chi 2$ (2, 705) = 3.14, p = 0.24).

Sports betting

Of the respondents, 28% bet on sports at least once a week. The frequency of sports betting was not associated with gambling severity groups ($\chi 2$ (2,190) = 4.58, p = 0.10).

Horse race betting

Horse race betting was gambled by 33.0% of respondents with at least once a week frequency. Frequent horse race betting was associated with more severe gambling problems ($\chi 2$ (2, 94) = 7.14, p = 0.03).

Internet gambling

Internet gambling was gambled by 33.3% of respondents with at least once a week frequency. Frequent internet betting was associated with more severe gambling problems ($\chi 2$ (2, 72) = 10.7, p = 0.005).

Association between socio-demographic characteristics and levels of gambling severity

The multinomial regression model (Table 4) shows the association between socio-demographic variables and levels of gambling severity. Covariates in the model were age, gender, years of education, unemployment, risk-level alcohol consumption and daily smoking. Younger age was significantly associated with all levels of problematic gambling. Male gender was similarly recognized to be strongly associated with all problem gambling levels. Education (less than twelve years) was also found to be significantly associated with both a low level of problem gambling and even more strongly with a moderate level of problem gambling. Unemployment was most strongly associated with problem gambling. Risk-level alcohol consumption (at least 6 units at least once a week) was significantly associated with low and moderate gambling problems. Smoking had a strong and significant association with all levels of gambling problems (daily smoking was compared with occasional- and non-smoking).

In summary, the significant associations for problem gambling were younger age, male gender, unemployment

Table 4 Multinomial regression analysis of variables associated with problem gambling severity

Measures	Low level of problems		Moderate level of problems		Problem gambling	
	OR	95% CI	OR	95% CI	OR	95% CI
Age[a]	0.98***	(0.97-0.99)	0.98**	(0.97-0.99)	0.97*	(0.94-0.99)
Male gender	2.46***	(1.94-3.12)	3.91***	(2.62-5.83)	7.51***	(2.78-20.29)
Education (<12yrs)	1.28*	(1.02-1.61)	1.95***	(1.36-2.81)	1.23	(0.56-2.69)
Unemployed	1.15	(0.72-1.83)	1.25	(0.64-2.44)	4.78**	(1.89-12.07)
Risk-level alcohol consumption[b]	1.62**	(1.21-2.16)	1.96**	(1.3-2.95)	0.74	(0.28-1.95)
Smoking (daily)	1.78***	(1.35-2.33)	1.80**	(1.21-2.68)	6.08***	(2.71-13.61)

Note. * p < .01 ** p < .001 *** p < .000.
Problem Gambling severity (Reference group: non-problem gambling).
[a]Analysed as a continuous variable.
[b] Risk-level alcohol consumption is defined as consuming at least 6 units at least once a week.

and daily smoking. Alcohol consumption, especially risk-level consumption, and lower years of education were significantly associated with both low and moderate gambling problems. According to the likelihood ratio test, the fit of the multinomial regression model was good ($\chi 2$ (18, 2826) = 275.9, $p < 0.001$). Correct classification rate was 79.2%.

Discussion

Socio-demographic characteristics

The analysis of socio-demographic characteristics shows that males were more vulnerable than females to develop gambling-related problems. This finding is in line with earlier studies both nationally [5-7,21] and internationally [22-24]. Additionally, young age was strongly associated with all levels of gambling. However, this association needs to be interpreted with caution, since even though the odds ratio was significant in the model, the strength of association was quite low. Divorced or separated individuals were also found to have more severe gambling problems compared to those married. Low level of education was associated with low and moderate levels of gambling problems and unemployment was associated with more severe gambling problems. These results resemble previous findings concerning socio-demographic characteristics of problem and pathological gamblers [7-11]. A vast body of evidence suggests that overall low socio-economic status is a risk factor for gambling, as also stated by Jimenez-Mucia et al. [25].

Prevalence

The results from this study show that the prevalence of problem gambling is in line with the findings of Williams, Volberg and Stevens [3]. The prevalence rate in Finland falls in the average rates category among other European countries such as Sweden, Switzerland, Estonia and Italy. The findings of this study are also in line with previous studies from Finland indicating that the trend of problem gambling has been more or less unchanged during the past few years. There appears to be a declining trend based on Finnish Gambling Population Surveys [4-6] but it is not statistically significant according to the recent analysis by Raisamo and Salonen [26]. A unique finding of this study was that the moderate level of gambling was 5.5% in this sample. This is important to acknowledge, since moderate level gamblers may be at risk of developing gambling problems and so suffer from an increasing amount of negative consequences caused by gambling. Thus moderate levels of gambling need to be monitored closely in the future.

Types of gambling

According to our results, Lotto was the most popular type of gambling, which has also been the case with previous population surveys in Finland [4]. Males bet on Lotto more frequently than females. On the other hand, females were more attracted to less risky gambling types such as lotto and scratch card gambling as compared to males also found by Hraba and Lee [27]. Frequent gambling in Lotto, daily lotteries, horse race betting and slot machine gambling were found to be associated with a more severe level of gambling.

In this study, slot machine gambling attracted the respondents gambling on a weekly basis. Slot machine gambling is classified as being addictive by nature [28] and has been reported to be the most trouble causing type of gambling among Finnish treatment-seeking gamblers [16]. The same trend was reported by Turja et al. [4] in a population sample where those who scored 5 or higher in SOGS reported their preferred game being slot machines. The rather high level of involvement in slot machine gambling, especially in Finland, could be explained by easy access and abundant availability. In Finland, slot machine gambling is easily and conveniently available in restaurants, grocery stores, shopping centres, kiosks and fuel stations around the country. A recent study in Finland by Warpenius et al. [29] investigated the enforcement of legal age limits on purchases of alcohol, tobacco and gambling slot machines. Their study showed that the enforcement of legal age limits for gambling slot machines was the weakest (4%)

compared to purchases of alcohol (49%) and cigarette (43%). One of the reasons for the insufficient enforcement of the law is, at least in kiosks, shopping centres and fuel stations, that the locations of slot machines are often out of reach of the shop keepers' desks, gambling time can be rather short and the gambler does not need to confront the shop keeper directly.

Availability, proximity and convenience of gambling venues have been found as being clear risk factors for gambling problems [30-32]. As a whole, males seem to choose riskier and faster game types, such as games like internet poker, which could partially explain why males tend to have more severe levels of gambling problems. Our results show that frequent involvement in internet gambling is associated with more severe levels of gambling problems. Our results also show that female moderate level of gambling was 2.6%, which is nearly three times lower compared to males. Females have been found to gamble often because of boredom, loneliness and isolation and thus maximize their gambling time with slower games [33,34]. Nevertheless, females have a growing risk in developing gambling problems, because progression in gambling problems is reported to be more rapid with females [35] and is known as telescoping phenomenon [36].

Comorbid alcohol and nicotine dependency

In this sample, males consumed remarkably more alcohol than females. Risk-level alcohol consumption and male gender were strongly associated with low and moderate levels of gambling problems. Comorbidity with substance use, especially alcohol, has been frequently reported in earlier gambling studies. The rate of pathological gambling among substance abusers has been reported to be four to ten times greater when compared to the general population [37,38]. Similarly, the study by Hakkarainen et al. [21] from Finland stated that especially heavy episodic drinking increased the risk of problem gambling. Petry has reported that the odds ratio for any alcohol use disorder and alcohol dependence as well as drug use and smoking are significantly related to pathological gambling [39].

In fact, nicotine dependence "accounts for some elevated risks for psychopathology with subsyndromal and problem/pathological levels of gambling" and subsyndromal level of gambling are associated with more severe psychopathology, as stated by Grant, Desai and Potenza [40]. In our study, nicotine dependence was significantly associated with all levels of gambling severity. This is consistent with previous findings [37-39,41]. Nicotine dependence is the second most frequent addiction after alcohol use disorder. Moreover, Petry, Stinson and Grant [41] reported that nicotine dependent individuals had a seven times higher odds ratio to be pathological gamblers when compared to non-smokers. Additionally, women with nicotine dependence were 14 times more likely to be pathological gamblers when compared to non-smoking women. In contrast, the likelihood for nicotine dependent males being pathological gamblers was five times higher when compared to non-smokers. Petry and Oncken [42] found that daily smokers were less able to control their gambling and had more severe gambling problems when compared to non-smokers. The association between gambling problems and nicotine dependence is evident, and one dependence may serve as a prime for another, as suggested by McGrath and Barrett [43].

Associations of socio-demographic characteristics, alcohol consumption, smoking and gambling severity

The results from this study revealed that younger age, male gender and daily smoking were associated with all levels of gambling problems. The notable likeness between low level and moderate level of gambling problems were less than twelve years of education and risk-level alcohol consumption. In contrast, unemployment was associated with problem gambling. These findings are soundly in line with previous findings and confirms that there appears to be certain groups of individuals that are more vulnerable to developing gambling problems.

Limitations

Despite the large sample size and good representation of the Finnish population, there are a number of limitations with the data, possibly the self-administered survey being the most important. A self-administered survey is not as candid and honest as a face-to-face interview, and future studies would benefit from face-to-face interviews or correction weights (1.00) as suggested by Williams et al. [3]. Two previous studies have found a post-questionnaire to produce higher rates of prevalence compared to telephone interviews [3]. Another aspect to mention is the response rate of 57%, which is low compared to face-to-face interviews or telephone interviews, but still adequate [3].

Another limitation is that this study reflects its results with previous prevalence studies from Finland. Previous prevalence studies from Finland [4-6] have used the South Oaks Gambling Screen (SOGS) as a measure of gambling. This study uses Problem Gambling Severity Index (PGSI) which is more conservative than SOGS, because it uses 8 as a cut-off point as compared to SOGS that uses 5. This study's gambling-related questions were part of a larger health survey. This means that this study's prevalence rate ought to be more realistic compared to specific gambling surveys, because specific gambling surveys may attract gamblers more than health surveys and produce higher prevalence rates [3].

This study used PGSI which has not been validated in a Finnish cultural context. So far, there are no validated gambling scales available in Finland.

Conclusions

To conclude, there is clear evidence that males seem to be more at risk of developing severe gambling problems. However, females should not be ignored because of two underlying factors: a) nicotine-dependent females are more vulnerable to developing gambling problems, b) development of gambling problems in females is faster as compared to males due to the telescoping phenomenon. Moreover, low socio-economic status, like low level of education and unemployment, can be seen as a risk factor for severe gambling problems.

The problem gambling prevalence in Finland has been more or less unchanged during past years. However, based on our findings it is as important to pay attention to the groups of low level and moderate level gamblers as their socio-demographic characteristics, and comorbid alcohol use and nicotine dependence all greatly resemble those of problem gamblers. These underlying factors linked with growing opportunities to gamble, especially in Finland, are only worsening the situation for those specific groups of individuals that may be at risk of shifting from one severity level to another.

From a public health perspective, these recognized associations should be taken into account by public health policy makers. Cox et al. [44] found that a high concentration of slot machines and the presence of a permanent casino were associated with an increased prevalence of gambling. This notion is important in the Finnish context with a visibly abundant amount of slot machines available, and a new casino complex emerging in the eastern part of Finland in the near future. Limitation of access to slot machines in Finland should be considered. The enforcement of the legal age limit on gambling should be made easier by limiting slot machines to the dedicated gambling area, where the enforcement of law is easier. The prevalence rate of gambling, in the eastern part of Finland, where the new casino complex emerges, should be closely monitored in the future. Gambling is a potential health issue, and there is a growing need to intensify awareness in the medical and health professions about gambling problems and related conditions. Awareness that three dependencies may co-occur, and should be screened for consistently in common health checks, especially within a vulnerable population.

Endnote

[1]Problem gambling includes also Pathological Gambling.

Competing interests

The authors declare that they have no competing interests.

Authors' contributions

SC, SB, MP, J-ER, SH, AU, HA, TL have contributed to the design of the study and interpretation of data. SC, SB, MP, SH, AU, HA, TL have been involved in drafting the manuscript or revising it critically for intellectual content. All authors read and approved the final manuscript.

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References

1. American Psychiatric Association: *Diagnostic and statistical manual of mental disorders.* 4th edition. Washington DC: American Psychiatric Association; 1994.
2. Rosenthal RJ: **Pathological gambling.** *Psychiatr Analyses* 1992, **22:**72–8.
3. Williams RJ, Volberg RA, Stevens RMG: *The population Prevalence of Problem Gambling: Methodological Influences, Standardized Rates, Jurisdictional Differences, and Worldwide Trends.* Report prepared for the Ontario Problem Gambling Research Centre and the Ontario Ministry of Health and Long Term Care; 2012. http://hdl.handle.net/10133/3068
4. Turja T, Halme J, Mervola M, Järvinen-Tassopoulos J, Ronkainen J-E: *Suomalaisten rahapelaaminen 2011 (Finnish gambling 2011).* Helsinki: National Institute for Health and Welfare (THL); 2012.
5. Ilkas H, Turja T: *Rahapelitutkimus. (Gambling study).* Helsinki: Taloustutkimus Oy. Sosiaali ja terveysministerio (Ministry of Social Affairs and Health); 2003.
6. Aho P, Turja T: *Suomalaisten rahapelaaminen 2007. (Finnish gambling 2007) Taloustutkimus Oy 2007.* Helsinki: Sosiaali ja terveysministerio (Ministry of Social Affairs and Health) 2007.
7. Johansson A, Grant JE, Kim SW, Odlaug BL, Götestam KG: **Risk factors for problematic gambling: A critical literature review.** *J Gambl Stud* 2009, **25:**67–92.
8. Kessler RC, Hwang I, LaBrie RA, Petukhova M, Sampson N, *et al*: **DSM-IV pathological gambling in the National Commorbidity Survey Replication.** *Psychol Med* 2008, **38:**351–60.
9. Toneatto T, Nguyen L: **Individual characteristics and problem gambling behavior.** In *Research and measurements Issues in Gambling Studies.* Edited by Smith G, Hodgins DC, Williams RJ. San Diego, CA: Academic Press; 2007:279–203.
10. Blanco C, Hasin DS, Petry N, Stinson FS, Grant BF: **Sex differences in subclinical and DSM-IV pathological gambling: Results from the National Epidemiologic Survey on Alcohol and Related Conditions.** *Psychol Med* 2006, **36:**943–53.
11. Welte J, Barnes G, Tidwell M, Hoffman J: **The prevalence of problem gambling among U.S. adolescents and young adults: results from a national survey.** *J Gambl Stud* 2008, **24:**199–33.
12. Lorains FK, Cowlishaw S, Thomas S: **Prevalence of comorbid disorders in problem and pathological gambling: systematic review and meta-analysis of population surveys.** *Addiction* 2011, **106:**490–498.
13. Lyk-Jensen SV: **New evidence from the grey area: Danish results for at-risk gambling.** *J Gambl Stud* 2010, **26**(3):455–67.
14. Griffiths MD: **Gambling technologies: Prospects for problem gambling.** *J Gambl Stud* 1999, **15:**265–283.
15. Parke J, Griffiths MD: **The psychology of fruit machine: The role of structural characteristics (revisited).** *Int J Ment Health Addic* 2006, **4:**151–79.
16. Jaakkola T, Murto A, Pajula M: *Peliklinikan toimintakatsaus 2012 ja Peluurin puolivuotisraportti 2012.* Annual Report of the Gambling Clinic of Helsinki, 2012 and Half Yearly Report of Gamblers Helpline; 2012. *Unpublished Finnish report 2012.* Retrieved from: http://www.peluuri.fi/data/liitteet/peliklinikka_toimintakatsaus_2012_pdf

17. Piispa M, Laitilainen E, Helakorpi S, Halme J, Alho H, Uutela A: *Rahapelaaminen, pelaamisen aiheuttamat ongelmat ja niiden yhteys elintapoihin. Tutkimus työikäisistä suomalaisista vuonna 2008 (Gambling, gambling problems and their relation to living habits among Finnish adults in 2008).* Helsinki: National Institute for Health and Welfare, Report 29/2009. http://www.thl.fi/thl-client/pdfs/295fc98c-8911-4656-88b0-4ec08da9645b.
18. Helakorpi S, Pajunen T, Jallinoja P, Virtanen S, Uutela A: *Suomalaisen aikuisvaeston terveyskayttaytyminen ja terveys, kevat 2010 (Health Behaviour and Health among the Finnish Adult Population, Spring 2010).* Helsinki: National Institute for Health and Welfare; 2011.
19. Helakorpi S, Holstila A-L, Virtanen S, Uutela A: *Suomalaisen aikuisvaeston terveyskayttaytyminen ja terveys, kevat 2011 (Health Behaviour and Health among the Finnish Adult Population, Spring 2011.* Helsinki: National Institute for Health and Welfare; 2012.
20. Ferris J, Wynne H: *The Canadian Problem Gambling Index: Final report.* Ottawa, Ontario: Canadian Centre on Substance Abuse; 2001.
21. Hakkarainen P, Jarvinen- Tassopoulos J, Metso L: **Miten alkoholinkäyttö, rahapelaaminen ja huumeidenkäyttö kytkeytyvät toisiinsa? (How alcohol consumption, gambling ja drug use associate with each other?) in Suomi juo (Title: Finland Drinking).** In Edited by Makela P, Mustonen H, Tigersted K. Helsinki: National Institute for Health and Welfare. Yliopistopaino; 2010.
22. Lejoyeux M: **McLoughlin, M, Ades J: Epidemiology of behavioural dependence: literature review and results of original studies.** *Eur J Psychiatry* 2000, **15:**129–34.
23. Potenza MN, Steinberg MA, McLaughlin SD, Wu R, Rounsaville BJ, O'Malley SS: **Gender-related differences in the characteristics of problem gamblers using a gambling helpline.** *Am J Psychiatry* 2001, **158:**1500–1505.
24. Kessler C, Hwang I, LaBrie R, Petukhova M, Sampson NA, Winters KC, *et al*: **DSM-IV pathological gambling in the national comorbidity survey replication.** *Psychol Med* 2008, **38:**1351–1360.
25. Jimenez-Murcia S, Stinchfield R, Fernandez-Aranda F, Santamarıa JJ, Penelo E, Granero R, Gomez-Pena M, Aymamıa N, Moragas L, Soto A, Menchon JM: **Are online pathological gamblers different from non-online pathological gamblers on demographics, gambling problem severity, psychopathology and personality characteristics?** *Int Gambl Stud* 2011, **11:**325–337.
26. Raisamo S, Salonen A: *Rahapelaaminen Suomessa vuosina 2003–2011. (Gambling in Finland in 2003–2011).* Helsinki; 2013. Unpublished manuscript.
27. Hraba J, Lee G: **Problem Gambling and Policy Advice: The Mutability and Relative Effects of Structural, Associational and Attitudinal Variables.** *J Gambl Stud* 1996, **11:**105–121.
28. Griffiths MD, Wood RTA, Parke J, Parke A: **Gaming research and best practice: Gaming industry, social responsibility and academia.** *Casino Gaming Int* 2007, **3:**97–103.
29. Warpenius K, Holmila M, Raitasalo K: **Peliin ei puututa. Alkoholin, tupakan ja rahapeliautomaattien ikärajavalvontaa testanneet ostokokeet vähittäisliikkeissä. (Enforcing age limits on purchases of alcohol and tobacco and the use of slot machines: test purchases in retail outlets).** *Yhteiskuntapolitiikka* 2012, **77**(4):375–385.
30. Moore SM, Thomas AC, Kyrios M, Bates G, Meredyth D: **Gambling accessibility: A Scale to Measure Gambling Preferences.** *J Gambl Stud* 2011, **27:**129–143.
31. Breen H: **Risk and protective factors associated with gambling products and services: Indigenous gamblers in North Queensland.** *Int J Mental Health Addict* 2012, **10:**24–38.
32. Brown S, Coventry L: *Queen of hearts: The needs of women with gambling problems.* Melbourne, Australia: Financial and Consumer Rights Council; 1997.
33. Trevorrow K, Moore S: **The Association Between Loneliness, Social Isolation and Women's Electronic Gaming Machine Gambling.** *J Gambl Stud* 1998, **14:**263–84.
34. Ladd G, Petry N: **Gender differences among pathological gamblers seeking treatment.** *Exp Clin Psychopharmacol* 2002, **10:**302–09.
35. Grant JE, Potenza MN, Weinstein A, Gorelick DA: **Introduction to Behavioral Addictions.** *Am J Drug Alcohol Abuse* 2010, **36**(5):233–241.
36. Lesieur HR, Blume SB, Zoppa RM: **Alcoholism drug abuse and gambling.** *Alcohol Clin Exp Res* 1986, **10:**33–38.
37. Spunt B, Dupont I, Lesieur H, Liberty HJ, Hunt D: **Pathological gambling and substance misuse: a review of the literature.** *Subst Use Misuse* 1998, **33:**2535–2560.
38. Petry N: **Comorbidity of disordered gambling and other psychiatric disorders**. In *Pathological Gambling: Etiology, Comorbidity and Treatment.* Edited by Petry N. Washington, DC: American Psychological Association; 2005.
39. Grant JE, Desai RA, Potenza MN: **Relationship of Nicotine Dependence, Sybsyndromal and Patyhological Gambling, and Other Psychiatric Disorders: Data From the National Epidemiologic Survey on Alcohol and Related Conditions.** *J Clin Psychiatry* 2009, **70**(3):334–343. Doi: 10.4088JJCP.08m04211.
40. Halme J, Helakorpi S, Laitalainen E, Uutela A, Alho H: **Rahapelaamisen tiheys on yhteydessä terveysriskeihin työikäisillä suomalaisilla. Gambling frequency is associated with health risks in Finnish working-age population.** *Sosiaalilääketieteellinen aikakausilehti* 2010, **47:**98–108.
41. Petry NM, Stinson FS, Grant BF: **Comorbidity of DSM-IV pathological gambling and other psychiatric disorders: results from the National Epidemilogic Survey on Alcohol and Related Conditions.** *J Clin Psychiatry* 2005, **66:**564–74.
42. Perty NM, Oncken C: **Cigarette smoking is associated with increased severity of gambling problems in treatment-seeking gamblers.** *Addiction* 2002, **97:**745–53.
43. McGrath DS, Barrett SP: **The comorbidity of tobacco smoking and gambling: a review of the literature.** *Drug Alcohol Rev* 2009, **28:**676–81.
44. Cox BJ, Yu N, Afifi TO, Ladouceur R: **A national survey of gambling problems in Canada.** *Can J Psychiatry* 2005, **50:**213–17.

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SUBSTANCE ABUSE TREATMENT, PREVENTION, AND POLICY

RESEARCH Open Access

Factors associated with disordered gambling in Finland

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Abstract

Background: The purpose of this study was to compare the socio-demographic characteristics of non-problem gamblers, problem gamblers and pathological gamblers, to investigate the association between gambling related factors and perceived health and well-being among the three subgroups of gamblers, and to analyse simultaneously socio-demographic characteristics, gambling related factors and perceived health and well-being and the severity of disordered gambling (problem gamblers and pathological gamblers).

Methods: The data were collected through a nationwide telephone survey in 2011. Participants were selected through a random population sample of 15-74-year-old Finns. From that sample, persons with any past-year gambling involvement (N = 3451) were selected for a subsample for the descriptive and inferential analysis in the present paper. Gambling was assessed using the South Oaks Gambling Screen. Statistical significance was determined by chi-squared tests. The odds ratio and effect size were computed by using multivariate-adjusted multinomial logistic regression analysis.

Results: The most significant socio-demographic characteristics (male gender, young age, education ≤12 years), gambling related factors (slot machine gambling, internet gambling) and perceived health and well-being (feeling lonely, smoking daily, risky alcohol consumption, mental health problems) explained 22.9 per cent of the variation in the severity of disordered gambling.

Conclusion: Male gender and loneliness were found to be associated with problem gambling in particular, along with smoking and risky alcohol consumption. Mental health problems and risky alcohol consumption were associated with pathological gambling. These identified associations between disordered gambling, mental health problems and risky alcohol consumption should be taken into consideration when implementing screenings of disordered gambling.

Keywords: Disordered gambling, Pathological gambling, Population survey, Problem gambling, Public health, South Oaks Gambling Screen

Introduction

Throughout the history people have been gambling. However, with the recent expansion of opportunities to gamble, gambling has become more problematic [1]. Today gamblers have the possibility to gamble more often and more frequently than ever before. Thus disordered gambling (DG) has become a serious public health concern worldwide. Most individuals gamble without any negative consequences due to gambling, but often excessive gambling leads to several adverse consequences to the gamblers, their significant others and to their communities [2]. The social and economic costs of DG are multitudinous. For example, the annual social cost of DG in the US is estimated to be 5 billion dollars [3,4].

The most severe pattern of DG is pathological gambling (PG) which is categorized by the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV) as a

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disorder of impulse control [5]. PG meets at least five of the ten criteria listed in DSM-IV. In addition to PG, DSM-IV can also be used to identify a milder form of disordered gambling, problem gambling. Problem gambling meets 3–4 of the ten criteria listed in DSM-IV. Epidemiological studies estimate that the prevalence of PG is between 1.1% and 5.3% among the adult population [6-9]. Recent analysis by Williams and colleagues [10] stated that the standardized past-year prevalence of PG varied from 0.5% to 7.6% internationally. Currently in Finland the past-year prevalence of PG is estimated to be 1%, and problem gambling 1.7% [11].

DG and its consequences are often hidden, complex, multifaceted and multidimensional phenomena [12]. The individuals with particular socio-demographic characteristics seem to be at risk for the development of DG. For example male gender, young age, low socio-economic status, low educational level, divorced or single marital status, and in some studies, a minority status [3,13-16] have been linked to an increased risk for DG. Psychiatric comorbid illnesses have also been recognized to be common amongst persons suffering from DG [17-19]. For example, severe depression, mood disorders, the use of nicotine and alcohol use disorder have been associated with DG [20]. Along with specific socio-demographic characteristics and psychiatric comorbid illnesses, availability of gambling venues is also associated with the prevalence of gambling [15,21,22]. These associations have been studied broadly worldwide. However, amount of studies from Finland are so far rather limited [11]. Therefore, more information is needed in order to develop and establish effective methods for prevention and treatment of DG in a Finnish cultural-context. Our research establishes new information as only few studies have earlier examined simultaneously socio-demographic characteristics, gambling related factors, as well as perceived health and well-being [9].

Given the rapid growth and the increasing availability of gambling in varying frequencies and forms at the present, gambling has become more accessible worldwide [8,23,24], both internationally and in Finland. In Finland especially with a large amount of slot machines available as well as with a growing availability of unregulated internet sites worldwide. As excessive gambling has the potential to become disordered, it is important to understand which groups have elevated risk to develop DG. Therefore, in this study we first compare the socio-demographic characteristics (gender, age, education, marital status) of non-problem gamblers, problem gamblers and PG's. Second, we investigate the association between gambling related factors (onset age, problem gambler close by, gambling frequency, money gambled and type of gambling) among the subgroups of gamblers. Third, we investigate the association between perceived health and well-being (loneliness, smoking, alcohol consumption, mental health and general health) among the subgroups of gamblers. Fourth, we analyse simultaneously socio-demographic characteristics, gambling related factors and perceived health and well-being and the severity of DG. These analyses are necessary for to find out the possible vulnerability factors related to DG and to develop early screenings of DG.

Methods

This study is based on a cross-sectional nationwide telephone survey entitled the Finnish Gambling 2011 [11]. The data were collected between 3rd October 2011 and 14th January 2012. Participants were selected from the Finnish Population Register by using a random sample of 15-74-year-old Finns. The sample size was 16,000, of whom 11,129 had a registered telephone number. Before the telephone interview, the participants received an introductory letter describing the purpose of the study. The participants, whose phone number was not in the Finnish Population Register, were sent a letter requesting their willingness to participate in the survey. Eventually a total of 4,484 participants completed the study. From that sample, participants with any past-year gambling involvement (N = 3,451) were drawn for this study. The sampling weights based on age, gender and residency of the Finnish population [11] were applied to all descriptive and inferential analysis. The ethics committee of the National Institute for Health and Welfare approved the research protocol.

Measurements

Gambling behaviour

Gambling behaviour was measured by using a 12-month time frame with the South Oaks Gambling Screen (SOGS) originally developed by Lesieur and Blume [24], with a total score of 20. SOGS is scored as: 0–2 = non-problem gamblers, 3–4 = problem gamblers, ≥5 = probable pathological gamblers. The Cronbach alpha for the SOGS was 0.913.

Socio-demographic characteristics

Socio-demographic characteristics analysed in this study included gender, age, education and marital status (Table 1).

Gambling related factors

Gambling related factors were onset age, problem gambler (significant other) gambling frequency, gambling expenditure and the types of games gambled (Table 2). The following questions were used with each factor: a) onset age, with the question of, 'When did you start gambling?' as a continuous factor; b) gambling of significant others (father, mother, sister or brother, grandparent, spouse, child, close friend) with the question of 'Do any of the following people have or have had problems

Table 1 Association between socio-demographic characteristics among the subgroups of gamblers

	All gamblers N = 3451	Non-problem gamblers n = 3345	Problem gamblers n = 67	Pathological gamblers n = 39	X^2 test
Characteristics	**%**	**%**	**%**	**%**	
Gender					
Male	53.2	52.2	85.7	70.0	$X^2 = 35.374$, df = 2, $p \leq 0.001$
Female	46.8	47.8	14.3	30.0	
Age, in years					
15-24	14.2	13.9	21.7	25.6	
25-34	18.2	17.9	23.2	28.2	$X^2 = 15.061$, df = 6, $p = 0.019$
35-49	26.9	27.0	26.1	15.4	
≥ 50	40.7	41.1	29.0	30.8	
Education					
≤ 12 years education	40.0	39.5	57.1	47.5	$X^2 = 9.792$, df = 2, $p = 0.007$
> 12 years education	60.0	60.5	42.9	52.5	
Marital status					
Married/registered relationship	48.1	48.9	27.9	25.0	$X^2 = 31.040$, df = 6, $p \leq 0.001$
Cohabiting	17.9	18.0	11.8	25.0	
Separated/divorced/widowed	10.2	10.0	16.2	15.0	
Single	23.7	23.1	44.1	35.0	

Significance (p) is determined by chi-squared (X^2) test; The data were weighted based on gender, age and residency.

with gambling?' with answering options (yes, no, do not know). This was a categorical factor, that was recorded into a dichotomous factor; c) gambling frequency, which was recoded into two categories (once a week or more/rarely than weekly); d) gambling expenditure, with the question of 'How much money did you spend into gambling during the past week?'. This was a continuous factor, that was recoded into three categories (do not know, 0-5€, 5€ or more); e) type of gambling with five options: lotto, scratch cards, slot machines, casino gambling or gambling in the internet during the past 12 months, as a categorical factor.

Perceived health and well-being

Factors related to health and well-being included gamblers' perceptions of loneliness, daily smoking, risky alcohol consumption, mental health and general health (Table 3). Loneliness was measured by using a question 'Do you feel lonely?' with five options, which were recoded into two categories (all the time/often and sometimes/rarely/never). Frequency of smoking was evaluated by using a question 'Have you smoked during the past 12 months?' with a 3-point Likert scale (daily, randomly, not at all). Random smokers and non-smokers were grouped into the same group for the analysis. Consumption of alcohol was measured by using the modified version of the Alcohol Use Disorders Identification Test, AUDIT-C [25]. AUDIT-C is a 3-item screen, which is used to identify those persons who are hazardous drinkers or have active alcohol use disorders (including alcohol abuse or dependence). The AUDIT-C is a 5-point Likert scale with scoring: a = 0 point, b = 1 point, c = 2 points, d = 3 points and e = 4 points. In this study, the total scores of AUDIT-C were counted by summing up the points for each item, and cut-off points recommended by Seppä [26] were used to define risky drinking among males (score ≥ 6) and females (score ≥5). The Cronbach alpha for the AUDIT-C was 0.611.

The mental health of the participants was assessed by using the Mental Health Inventory (MHI-5) [27] comprising the following five items: nervousness, blues, jollity, calmness and happiness. MHI-5 was measured by using a 6-point Likert scale scoring: 1 = all of the time, 2 = most of the time, 3 = a good bit of the time, 4 = some of the time, 5 = a little of the time, 6 = none of the time. The total scores of MHI-5 factors were calculated by summing up the score of each item and the sums (range 4–30) were scaled into 1–100. Cut-off score of 52 or less was used: lower scores indicate clinically significant mental health problems [28]. The Cronbach alpha for the MHI-5 was 0.768. General health was inquired by

Table 2 Association between gambling related factors and subgroups of gamblers

	All gamblers N = 3451	Non-problem gamblers n = 3345	Problem gamblers n = 67	Pathological gamblers n = 39	X^2 test
Gambling related factors	%	%	%	%	
Onset age, years					$X^2 = 22.174$, df = 2, $p \leq 0.001$
< 18	56.6	55.8	75.7	82.5	
≥ 18	43.4	42.2	24.3	17.5	
Problem gambler (significant other)					$X^2 = 33{,}177$, df = 2, $p \leq 0.001$
Yes, at least one	19.9	19.2	37.1	47.5	
No, none	80.1	80.8	62.9	52.5	
Gambling frequency					
Once a week or more	45.8	44.4	88.4	77.5	$X^2 = 69.094$, df = 2, $p \leq 0.001$
Rarely than weekly	54.2	55.6	11.6	22.5	
Money gambled, past week					
Do not know	19.6	19.5	21.4	25.6	
0-5 euro	50.8	52.2	10.0	17.9	$X^2 = 80.405$, df = 4, $p \leq 0.001$
> 5 euro	29.5	28.3	68.6	56.5	
Played lotto, past 12 months					
Yes	87.5	87.6	87.1	80.0	$X^2 = 2.112$, df = 2, $p = 0.348$
No	12.4	12.4	12.9	20.0	
Played scratch cards, past 12 months					
Yes	44.0	43.4	62.3	62.5	$X^2 = 15.451$, df = 2, $p \leq 0.001$
No	56.0	56.6	37.7	37.5	
Played slot machines, past 12 months					
Yes	42.4	40.7	90.0	82.5	$X^2 = 94.750$, df = 2, $p \leq 0.001$
No	57.6	59.3	10.0	17.5	
Played casino, past 12 months					
Yes	2.8	2.4	7.2	30.8	$X^2 = 117.664$, df = 2, $p \leq 0.001^{\dagger}$
No	97.2	97.6	92.8	69.2	
Internet gambling, past 12 months					
Yes	24.5	23.6	48.6	55.0	$X^2 = 43.377$, df = 2, $p \leq 0.001$
No	75.5	76.4	51.4	45.0	

Significance (p) is determined by chi-squared (X^2) test; †33.3% cells have expected count less than 5; the data were weighted based on gender, age and residency.

using a question 'How is your general health at present?', with five options recoded into three categories (bad/somewhat bad, average and good/somewhat good).

Statistical analysis

The analyses were carried out in two steps. First, chi-square test was used to compare the statistical significance (p) of the associations of the categorical factors and the three subgroups of gamblers (Tables 1, 2 and 3). The factors for these bivariate analyses were chosen as based on strong evidence gained from the previous studies. All categorical factors are presented using frequencies and percentages.

Then factors associated with the severity of DG were explored using a multivariate-adjusted multinomial logistic regression analysis (multinomial regression analysis).

Table 3 Association between perceived health and well-being and subgroups of gamblers

	All gamblers N = 3451	Non-problem gamblers n = 3345	Problem gamblers n = 67	Pathological gamblers n = 39	X^2 test
Perceived health/well-being	%	%	%	%	
Feeling lonely					X^2 =27.509, df = 2, p ≤ 0.001
All the time/often	17.3	16.7	38.6	30.0	
Never/very rarely/sometimes	82.7	83.3	61.4	70.0	
Smoking					X^2 =57.468, df = 2, p ≤ 0.001
Daily smoking	19.9	18.8	48.6	47.5	
Not at all/occasionally	80.1	81.2	51.4	52.5	
Alcohol risk consumer, AUDIT-C					
At risk	28.3	26.9	68.8	71.4	X^2 =86.394, df = 2, p ≤ 0.001
Not at risk	71.7	73.1	31.2	28.6	
Mental health, MHI-5					
Clinically significant problem	3.3	3.0	8.6	17.9	X^2 =33.024, df = 2, p ≤ 0.001
No problem	96.7	97.0	91.4	82.1	
General health					
Bad/somewhat bad	2.8	2.7	4.3	7.7	X^2 =17.159, df = 4, p = 0.005[†]
Average	13.0	12.8	27.1	10.3	
Good/somewhat good	84.2	84.5	68.6	82.0	

AUDIT-C, the Alcohol Use Disorders Identification Test, score for risk consumption ≥5 among women and ≥6 among men; *MHI-5*, the Mental Health Inventory, scale 1–100, clinically significant problem ≤52. Significance (p) is determined by chi-squared (X^2) test; the data were weighted based on gender, age and residency; [†]22,2% cells have expected count less than 5.

In this analysis, problem gamblers and PG's were compared with non-problem gamblers. Selected factors consisted of socio-demographic characteristics, gambling related factors and perceived health and well-being and they were included in the final model simultaneously (Table 4).

Socio-demographic characteristics (gender, age and education) used in the model carry strong theoretical evidence from past studies. To precisely optimise the model, two game types, which represent the most widespread accessibility and addictive potential, slot machine and internet gambling, were included into the model as gambling related factors. Finally, loneliness, daily smoking, risky alcohol consumption and overall mental health (MHI-5) represented significant factors related to perceived health and well-being.

The best fitting model was chosen by exploring different combinations of factors and comparing different models using the coefficient of determination (R squared). Results of the multinomial regression model are presented as odd ratios (OR) and their corresponding 95% confidence intervals (CI). Goodness of fit was assessed using the Nagelkerke's R^2.

Results

Bivariate analysis: associations between socio-demographic characteristics and the subgroups of gamblers

The socio-demographic characteristics of the different subgroups of gamblers are summarized in Table 1. There were 3,451 participants (53.2% males and 46.8% females) with the mean age of 44.27 years (SD = 15.97). Overall, there were a greater proportion of males than females in all of the subgroups of gamblers. Compared with non-problem gamblers (52.2%) the percentage of males was greater amongst problem gamblers (85.7%) and PG's (70.0%), ($\chi 2$ = 35.374, *df* = 2, p <0.001). According to our results, PG's were younger compared to the other subgroups of gamblers ($\chi 2$ = 15.061, *df* = 2, p <0.019). There were statistically significantly more gamblers with twelve or less years of education in the problem gambling group (57.1%) compared to non-problem gamblers (39.5%) and to PG's (47.5%), ($\chi 2$ = 9.792, *df* = 2, p <0.007). Most of the non-problem gamblers (66.9%) were married or lived in a registered relationship or were cohabiting, while the corresponding figures for problem gamblers were 39.7% and for PG's 50.0%.

Table 4 Simultaneously analysed factors: socio-demographic characteristics, gambling related factors and perceived health and well-being and the severity of disordered gambling (Problem and Pathological gambling)

		Problem gambling[a] n = 67		Pathological gambling[a] n = 39	
	Factor	**OR**	**95% CI**	**OR**	**95% CI**
Socio-demographic					
	Male	2.48*	1.20–5.12	1.10	0.49–2.46
	15–34 years old	0.86	0.50–1.46	1.29	0.63–2.66
	≤12 years education	1.53	0.90–2.60	1.25	0.61–2.54
Gambling related					
	Played slot machines, past 12 months	6.88***	3.05–15.56	4.70**	1.72–12.85
	Internet gambling, past 12 months	2.15**	1.26–3.38	2.88**	1.40–5.92
Perceived health and well-being					
	Feeling lonely	3.47***	1.98–6.05	1.78	0.78–4.04
	Smoking daily	2.01*	1.15–3.49	1.58	0.74–3.37
	Risk alcohol, AUDIT-C	2.57**	1.43–4.63	3.09**	1.38–6.94
	Mental health problem, MHI-5	1.40	0.50–3.88	4.01**	1.41–11.43
Nagelkerke = 0,229					

[a]Reference group: Non-problem gamblers (n = 3345); The data (N = 3451) were weighted based on gender, age and residency; Multivariate-adjusted multinomial logistic regression analysis; * < 0.05, ** < 0.01, *** < 0.001; *AUDIT-C*, the Alcohol Use Disorders Identification Test, score for risk consumption ≥5 among women and ≥6 among men; *MHI-5*, the Mental Health Inventory, scaled into 1–100, clinically significant problem ≤52.

Bivariate analysis: associations between gambling related factors and the subgroups of gamblers

Association between gambling related factors and the subgroups of gamblers are presented in Table 2. Onset age of gambling, namely below 18 years, was lower among problem and PG's than among non-problem gamblers ($\chi2 = 22.174$, $df = 2$, $p < 0.001$). Problem gamblers and PG's had or have had a problem gambler (significant other) more often than the non-problem gamblers ($\chi2 = 33.177$, $df = 2$, $p < 0.001$). Problem gamblers (88.4%) gambled more frequently (once a week or more) as compared to PG's (77.5%) or non-problem gamblers (44.4%).

Problem gamblers spent more money on gambling than the other subgroups of gamblers (more than 5€ per week). However, the percentage of gamblers who did not know the amount they had spent on gambling was the greatest among PG's ($\chi2 = 80.405$, $df = 2$, $p < 0.001$).

Lotto was the most often gambled game among all subgroups of gamblers. Non-problem gamblers gambled lotto (87.6%) slightly more often than problem gamblers (87.1%) or PG's (80.0%), ($\chi2 = 2.112$, $df = 2$, $p < 0.348$). Scratch cards were gambled more frequently by problem gamblers (62.3%) and PG's (62.5%) as compared to non-problem gamblers (43.4%), ($\chi2 = 15.45$, $df = 2$, $p < 0.001$). Similarly, slot machine gambling was the most prevalent among problem gamblers: 90.0% of the problem gamblers, 82.5% of the PG's and 40.7% of the non-problem gamblers ($\chi2 = 94.750$, $df = 2$, $p < 0.001$) gambled slot machines. Casino gambling was the most prevalent among PG's (30.8%) as compared with problem gamblers (7.2%) or non-problem gamblers (2.4%), ($\chi2 = 117.664$, $df = 2$, $p < 0.001$). Internet gambling was also the most prevalent among PG's (55%) as compared to problem gamblers (48.6%) and non-problem gamblers (23.6%).

Bivariate analysis: Perceived health and well-being and the subgroups of gamblers

Associations between perceived health and well-being and the subgroups of gamblers are presented in Table 3. Problem gamblers reported feelings of loneliness more often than the other subgroups of gamblers ($\chi2 = 27.509$, $df = 2$, $p < 0.001$). Problem gamblers also smoked slightly more on a daily basis than other subgroups of gamblers ($\chi2 = 57.468$, $df = 2$, $p < 0.001$). According to our results PG's consumed more alcohol in a risky level (71.4%) than problem gamblers (68.8%) and non-problem gamblers (26.9%), ($\chi2 = 86.394$, $df = 2$, $p < 0.001$). PG's also experienced clinically significant mental health problems more often than the other subgroups of gamblers ($\chi2 = 33.024$, $df = 2$, $p < 0.001$). However, with general health, there were no significant differences between the studied subgroups of gamblers. All in all, problem gamblers reported loneliness and smoked tobacco more than PG's. PG's, in turn, consumed alcohol at a risky level and had mental health problems more often than problem gamblers.

Multinomial regression analysis: simultaneously analysed factors and the severity of DG

The simultaneously analysed socio-demographic characteristics, gambling related factors and perceived health

and well-being and the severity of DG was examined by multinomial regression analysis (Table 4). In this analysis, male gender was the only socio-demographic characteristic that was statistically significantly associated with problem gambling (OR 2.48, CI 1.20-5.12). Young age (15–35) and education ≤ 12 years were not significantly associated with either problem gambling or PG. Game type was significantly associated with DG. Past-year slot machine gambling was significantly associated with problem gambling (OR 6.88, CI 3.05-15.56) and PG (OR 4.70, CI 1.72-12.85). Likewise was the past-year internet gambling associated with problem gambling (OR 2.15, CI 1.26-3.38) and PG (OR 2.88, CI 1.40-5.92). Associations with perceived health and well-being, were found to be significant with problem gambling as follows: loneliness (OR 3.47, CI 1.98-6.05), daily tobacco smoking (OR 2.01, CI 1.15-3.49) and risky alcohol consumption (OR 2.57, CI 1.43-4.63). Similarly, risky alcohol consumption was associated with PG statistically significantly (OR 3.09, CI 1.38-6.94). In addition, mental health problems were significantly associated with PG (OR 4.01, CI 1.41-11.43).

In the multinomial model, socio-demographic characteristics (male gender, young age, education ≤ 12 years), gambling related factors (played slot machines, internet gambling) and perceived health and well-being (loneliness, daily tobacco smoking, risky alcohol consumption, mental health problems) explained 22.9% of the variation in the severity of DG.

Discussion

Socio-demographic characteristics

According to our bivariate analysis, socio-demographic characteristics e.g., male gender, low level of education, single marital status and young age were all associated with DG. Similarly, risky alcohol consumption, smoking and loneliness were all associated with problem gambling and more severe mental health problems with PG. These findings are in line with previous research [29-33].

Young males are characteristically more often sensation seekers and thus they have a higher vulnerability to develop addictions [34-36]. Also in the multinomial regression analysis, a strong association between male gender and severity of DG were found. Even though prevalence of DG is greater in males than females, the progression of DG is faster with females [37]. In our study 30% of the PG's were females. It has been proposed that the main reasons for females to gamble are often boredom, loneliness and isolation. Thus females tend to seek less adventurous gambling types and choose games that maximize their gambling time [38,39] to offer an escape from feeling isolated and lonely.

In the bivariate analysis, there were significantly more young gamblers (ages 15–24 and 25–34) in both DG subgroups. On the contrary, in a multinomial regression analysis, the age was no longer as strongly associated with the severity of DG, nor was this relationship clearly linear. This can be explained by the inclusion of other explanatory factors in the model, such as other socio-demographic characteristics, as well as gambling and health-related variables.

Gambling related factors

In the bivariate analysis, onset age of gambling was associated with both subgroups of DG, as stated earlier by Volberg et al. [40]. In addition, our results show problem gamblers to gamble more frequently and to spend more money on gambling on a weekly basis than PG's. On the other hand, most of the PG's did not know how much money they had spent on gambling. Not knowing how much one has spent on gambling may reflect the very nature of the gambling pathology: denial of the problem. According to Williams and Volberg [41,42] 'being ahead or in a winning state' may well reflect gamblers biased perception of a winning state. Biased perception means that wins are well remembered and maximized and losses are forgotten or minimized.

PG's gambled more frequently both internet and casino games than problem gamblers. Problem gamblers in turn preferred slot machine gambling more compared to PG's. This difference could be explained perhaps by PG's chasing losses by larger bets as based on 'gamblers fallacy'. In turn, problem gamblers, that do not meet the full criteria of PG, may have temptation to try their 'luck' with slot machines, perhaps due to their easy accessibility. Slot machine gambling has been reported as the most problem causing type of gambling in Finland [43-45]. In Finland, slot machines are openly scattered in shopping centres, small shops, kiosks, restaurants, casino and casual gambling arcades. This is why a concern has emerged especially towards slot machine gambling. Griffiths [46] classified slot machine gambling as having a high addictive potential due to its fast tempo and other properties. Besides the easy access and availability, slot machines are likely to increase involvement in gambling and the development of DG [47-49]. Casino, internet and slot machine gambling are all classified as addictive gambling types [50,51].

Both subgroups of DG gambled lotto rather frequently. In a Finnish context, lotto is the most popular game type in general. The addictiveness of lotto comes from the structural characteristics of the game. Lotto has the potential to be gambled at various intervals be it yearly, weekly or daily. The low cost chance of winning a very large jackpot prize urges gamblers to buy lotto repeatedly. However, the low event frequency of lotto may explain why other types of gambling are more addictive than lotto [52].

Perceived health and well-being

Based on multinomial regression analysis, a new finding was that problem gamblers in particular, reported to be lonelier than non-problem gamblers or PG's. PG's, on the other hand, reported having more mental health problems than problem gamblers and non-problem gamblers. Loneliness, which was associated with problem gambling, can be seen as less severe than overall problems with mental health. Therefore, detecting loneliness among problem gamblers is important and could be used, for example, as a guiding tool/question in the screening of DG. Loneliness, analysed simultaneously with certain socio-demographic characteristics, such as being a young male, may lead to a more severe form of DG or more severe mental health problems if not tackled early enough. Loneliness [39] may be a result or consequence of gambling, given the fact that this is a cross-sectional design. Both loneliness and social isolation is associated with gambling especially among female gamblers [39]. Boredom, which refers to lack of interest in general, is also linked with gambling [53,54].

According to this study DG's were smoking more and consuming alcohol at risk level more often than non-problem gamblers. This finding is in line with earlier studies: PG is a frequent comorbid diagnosis among substance abusers and vice versa [55]. In addition to substance abuse, also mental health problems such as depression co-occur at high rates amongst DG's [55].

Our multinomial regression analysis shows that there are certain similarities amongst two subgroups of DG's (e.g. type of games gambled and risky alcohol consumption) and therefore, it would be beneficial to use these identified factors in prevention and early detection programs as one additional guideline. DG may get worse over time if not detected early enough. Thus there is an urgent need to better identify and prevent DG before it becomes more difficult to overcome.

DG and its consequences are often hidden, due to feelings of shame and guilt related to excessive gambling and denial of the problem and therefore can be unrecognized for a considerable time. Thus the early identification of DG within the health care system is often difficult. However, by increasing general health practitioners' awareness of the symptoms and most common comorbidities of DG, early detection and better screening of gambling problems can be increased. Based on our multinomial regression analysis, loneliness, smoking and risky alcohol consumption were found to be associated with problem gambling and should be taken into account when screening and treating DG.

Relevance to public health perspective: prevention, protection and detection

Moreover, our study's multinomial regression analysis found slot machine gambling to be associated with DG. Slot machine gambling is known to be a game of pure chance and therefore by offering accurate knowledge about the features of the games, such as the existence of erroneous beliefs related to gambling or probabilities of winning in different games, the harms caused by gambling can be reduced and treated [56-62]. Also a recent publication from the European Commission (EC) recommended more clear information to be given about gambling products [63]. The same has been stated in the Reno Model [64]. Therefore, all games, betting and lottery tickets should have a product warning providing information about the harmful effects and possible negative consequences of gambling. Moreover, anti-stigma campaigns could also increase the public knowledge about DG and could increase the treatment seeking level of the individuals with disordered gambling [9].

It is important to acknowledge that certain game types and their availability and easy accessibility are risk factors for the development of DG [44,65-67]. An alerting notion in two Finnish reports [41] is that of a new type of game that is offered via internet: internet slot machine games, where two addictive game types are combined with 24/7 accessibility. As a solution to these maintaining factors of gambling, Marshall [68] sets a good comparison on other public health issues, such as obesity, tobacco smoking and alcohol problems. In all of these public health issues the availability (e.g. fast food, cigarettes and alcohol) has worsened the condition at hand. Increasing the public awareness of the health issues involved, would give people more choice in their behaviour. This same approach is relevant and could also work with gambling issues.

Adams et al. [69] have brought up the question of how policy makers could respond to the harms caused by gambling. Harm minimization initiatives have been targeted into reducing availability and increasing education about harms of gambling. A good example from a harm minimization strategy comes from the Australian state of Victoria, where the number of Electronic Gambling Machines (EGM's) was reduced particularly in low-income communities, where the gambling was linked with harmful gambling [68,70]. Increasing such health promotion programs to include harms of gambling is recommended. As it is, expansion of commercial gambling is taking place on a global basis, especially internet gambling, which provides round-the-clock access to various gambling types, increasing the number of people getting involved and perhaps encountering some form of DG.

Limitations

First, a review of the population-based gambling studies indicates that the mean response rate in studies using telephone interview is generally 52.5% [10]. Therefore, the response rate of this study can be considered as low (39.9%). Moreover, the proportion of young male

participants was lower than the national average [11]. This is a typical phenomenon in gambling studies and an important notion since the prevalence of DG is typically high among young males [14-16]. The data weighting was performed to correct this bias. Second, the total number of problem gamblers and PG's was 106. However, international comparison indicates that this figure was higher than the international median of 52 [10]. Third, the SOGS instrument used in assessing gambling behaviour was originally developed in clinical context [24]. On the other hand, the version with a shorter time frame has been validated in a population-based study [71]. In this study, the internal consistency and reliability of the SOGS appeared to be good. Fourth, this study is limited by the cross-sectional study design; therefore, no conclusions about the causal connection can be done. At the same time, the multinomial method used enhances the reliability since it notices the effect of the simultaneously analysed factors.

Conclusion

The consequences of gambling at societal, individual and familial level, calls for new actions both in Finland and internationally. Male gender and loneliness were found to be associated with problem gambling in particular, along with smoking and risky alcohol consumption. Mental health problems and risky alcohol consumption were associated with pathological gambling. These identified associations between disordered gambling, mental health problems and risky alcohol consumption should be taken into consideration when implementing more in-depth and targeted screening of DG. It is also important to consider these associations when planning treatment of DG.

Competing interests

The authors declare that they have no competing interests.

Authors' contribution

The study design was develop by all authors. SC, SB, AHS, MP, HA, JER, TL have made substantial contributions to the analysis and interpretation of the data. SC, SB, AHS, MP, HA, TL have been involved in drafting the manuscript and revising it critically. All authors have given final approval of this version to be published.

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References

1. Petry NM: **Internet gambling: an emerging concern in family practice medicine?** *Fam Pract* 2006, **23:**421–426.
2. GRA (Gambling Research Australia): *Problem gambling and harm: towards a national definition*; 2005. http://www.adelaide.edu.au/saces/gambling/publications/ProblemGamblingAndHarmTowardNationalDefinition.pdf
3. National Research Council (NRC): *Pathological gambling: a critical review.* Washington, D.C: National Academy Press; 1999.
4. Grinols EL: *Gambling in America: costs and benefits.* Cambridge: Cambridge University Press; 2004.
5. American Psychiatric Association (APA): *Diagnostic and statistical manual of mental disorders.* 4th edition. Washington DC; 1994.
6. Shaffer HJ, Hall MN, Vander BJ: **Estimating the prevalence of disordered gambling behavior in the United States and Canada: a research synthesis.** *Am J Public Health* 1999, **89:**1369–1376.
7. Shaffer HJ, Hall MN: **Updating and refining prevalence estimates of disordered gambling behavior in the United States and Canada.** *Can J Public Health* 2001, **92:**168–172.
8. Welte JW, Barnes GM, Wieczorek WF, Tidwell MC, Parker J: **Gambling participation in the U.S.—results from a national survey.** *J Gambl Stud* 2002, **18:**313–337.
9. Hodgins DC, Stea JN, Grant JE: **Gambling disorders.** *Lancet* 2011, **378:**1874–1884.
10. Williams RJ, Volberg RA, Stevens RMG: ***The population prevalence of problem gambling: methodological influences, standardized rates, jurisdictional differences, and worldwide trends.*** *Report prepared for the Ontario problem gambling research centre and the Ontario ministry of health and long term care.* May 8, 2012. http://hdl.handle.net/10133/3068.
11. Turja T, Halme J, Mervola M, Jarvinen-Tassopoulous J, Ronkainen JE: *Suomalaisten rahapelaaminen 2011 [Finnish Gambling 2011].* Helsinki: National Institute for Health and Welfare (THL). Report 14/2012.
12. Ashley LL, Boehlke KK: **Pathological gambling: a general overview.** *J Psychoactive Drugs* 2012, **44:**27–37.
13. Winters KC, Stinchfield R, Fulkerson J: **Patterns and characteristics of adolescent gambling.** *J Gambl Stud* 1993, **9:**371–386.
14. Lund I: **Lessons from the grey area: a closer inspection of at-risk gamblers.** *J Gambl Stud* 2007, **23:**409–419.
15. Ladouceur R, Boudreault N, Jacques C, Vitaro F: **Pathological gambling and related problems among adolescents.** *J Child & Adolesc Subst Abuse* 1999, **8:**55–68.
16. Lyk-Jensen SV: **New evidence from the grey area: Danish results for at-risk gambling.** *J Gambl Stud* 2010, **2010**(26)**:**455–467.
17. Black DW, Moyer T: **Clinical features and psychiatric comorbidity of subjects with pathological gambling behavior.** *Psychiatr Serv* 1998, **49:**1434–1439.
18. Cunningham-Williams RM, Cottler LB, Compton WM, Spitznagel EL: **Taking chances: problem gamblers and mental health disorders–results from the St. Louis Epidemiologic Catchment Area Study.** *Am J Public Health* 1998, **88:**1093–1096.
19. Roy A: **Pathological gambling: a psychobiological study.** *Arch Gen Psychiatry* 1988, **45:**369–373.
20. Lorains FK, Colishaw S, Thomas SH: **Prevalence of comorbid disorders in problem and pathological gambling: systematic review and meta-analysis of population surveys.** *Addiction* 2011, **106:**490–489.
21. Volberg RA: **The prevalence and demographics of pathological gamblers: implications for public health.** *Am J Public Health* 1994, **84:**237–241.
22. Cambell F, Lester D: **The impact of gambling opportunities on compulsive gambling.** *J Soc Psychol* 1999, **139:**126–127.
23. Azmier J: *Gambling in Canada 2005: statistics and context.* Calgary: AB: Canada West Foundation; 2005.
24. Lesieur HR, Blume SB: **The South Oaks Gambling Screen (SOGS): a new instrument for the identification of pathological gamblers.** *Am J Psychiatry* 1987, **144**(9):1184–1188.
25. Bush K, Kivlahan DR, McDonell MB, Fihn SD, Bradley KA: **The audit alcohol consumption questions (Audit-C): an effective brief screening test for problem drinking.** *Arch Intern Med* 1998, **158:**1789–1795.
26. Seppä K: *Potilaan haastatteleminen: kolmen kysymyksen AUDIT-C [Interviewing a patient: three question AUDIT-C] Suomen lääkäriseura [Finish Association of Medical Doctors], Duodecim*; 2010. http://www.kaypahoito.fi/web/kh/suositukset/naytaartikkeli/…/nak04611

27. Veit CT, Ware JE: **The structure of psychological distress and well-being in general populations.** *J Consult Clin Psychol* 1983, **51:**730–742.
28. Berwick DM, Murphy JM, Goldman PA, Ware JE Jr, Barsky AJ, Weinstein MC: **Performance of a five-item mental health screening test.** *Medical Care* 1991, **29:**169–176.
29. Gerstein DR, Hoffmann JP, Larison C, Engelman L, Murphy S, Palmer A: *Gambling impact and behavior study: report to the national gambling impact study commission.* Chicago: National Opinion Research Center; 1999.
30. Ronnberg S, Volberg R, Abbott M, Moore L, Andén A, Munck I, *et al*: *Spel och spelberoende I sverige [Gambling problems in Sweden].* Stockholm: Fölkhäsoinstitutet; 1999. Report No.3 I.
31. Sproston K, Ernst B, Orford J: *Gambling behaviour in Britain: results from the British gambling prevalence survey.* London: National Centre for Social Research; 2000.
32. Gotestam KG, Johansson A: **Characteristics of gambling and problematic gambling in the Norwegian context: a DSM-IV-based telephone interview study.** *Addict Behav* 2003, **28:**189–197.
33. Lund I: **Gambling and problem gambling in Norway: what part does the gambling machine play?** *Addiction Research & Theory* 2006, **14:**475–491.
34. Blaszczynski AP, Buhrich N, McConaghy: **Pathological gamblers, heroin addicts and controls compared on the E.P.Q. Addiction scale.** *Br J Addict* 1985, **80**(3):315–319.
35. Nower L, Derevensky JL, Gupta R: **The relationship of impulsivity, sensation seeking, coping, and substance Use in youth gamblers.** *Psychology of Addictive Behaviour* 2004, **1:**49–55.
36. Bonnaire C, Bungener C, Varescon I: **Subtypes of French pathological gamblers: comparison of sensation seeking, alexithymia and depression scores.** *J Gambl Stud* 2009, **25:**455–471.
37. Ladd G, Petry N: **Gender differences among pathological gamblers seeking treatment.** *Exp Clin Psychopharmacol* 2002, **10:**302–309.
38. Brown S, Coventry L: *Queen of hearts: the needs of women with gambling problems.* Melbourne, Australia: Financial and Consumer Rights Council; 1997.
39. Trevorrow K, Moore S: **The association between loneliness, social isolation and women's electronic gaming machine gambling.** *J Gambl Stud* 1998, **14:**263–284.
40. Volberg RA, Abbott MW, Rönnberg S, Munck IME: **Prevalence and risks of pathological gambling in Sweden.** *Acta Psychiatr Scand* 2001, **104:**250–256.
41. Williams RJ, Volberg RA: **Impact of survey description, administration method, and exclusionary criteria on population prevalence rates of problem gambling.** *International Journal of Gambling Studies* 2009, **9:**101–117.
42. Williams RJ, Volberg RA: *Best practices in the population assessment of problem gambling.* Guelph, Ontario: Report submitted to the Ontario Problem Gambling Research Centre; 2010.
43. Lahti T, Halme J, Pankakoski M, Sinclair D, Alho H: **Characteristics of treatment seeking Finnish pathological gamblers: baseline data from a treatment study.** *Int J Ment Heal Addict* 2013, **11:**307–314.
44. Jaakkola T, Murto A, Pajula M: *Peliklinikan toimintakatsaus 2012 ja Peluurin puolivuotisraportti 2012 [Annual report of the gambling clinic of Helsinki, 2012 and half yearly report of gamblers helpline, Peluuri, 2012].* Unpublished Finnish report 2012 [http://www.peluuri.fi/data/liitteet/peliklinikka_toimintakatsaus_2012_pdf.pdf].
45. Castrén S, Pankakoski M, Tamminen M, Lipsanen J, Ladouceur R, Lahti T: **Internet-based CBT intervention for gamblers in Finland: experiences from the field.** *Scand J Psychol* 2013, **54:**230–235.
46. Griffiths M, Wood R, Parke J, Parke A: **Gaming research and best practice: gaming industry, social responsibility and academia.** *Casino and Gaming International* 2007, **3:**97–103.
47. Rush B, Veldhuizen S, Adlaf E: **Mapping the prevalence of problem gambling and its association with treatment accessibility and proximity to gambling venues.** *Journal of Gambling Issues* 2007, **20:**193–214.
48. Moore SM, Thomas AC, Kyrios M, Bates G, Meredyth D: **Gambling accessibility: a scale to measure gambler preferences.** *J Gambl Stud* 2011, **27:**129–143.
49. Breen H: **Risk and protective factors associated with gambling products and services: indigenous gamblers in north Queensland.** *Int J Ment Health Addiction* 2012, **10:**24–38.
50. Griffiths MD: *Videogame addiction: fact or fiction? in Willoughby, T. & Wood, E. (Eds.). Children's learning in a digital world (pp. 85–103).* Oxford: Blackwell Publishing; 2007.
51. Griffiths M, Wood R, Parke J: **Reducing addiction risk in developing online games.** *World Online Gambling Law Report* 2008, **7:**15–6.
52. Griffiths M, Wood R: **The psychology of lottery gambling.** *Int Gambl Stud* 2001, **1:**27–45.
53. Blaszczynski A, McConaghy N, Frankova A: **Boredom proneness in pathological gambling.** *Psychol Rep* 1990, **67:**35–42.
54. Tse S, Dyall L, Clarke D, Abbott M, Townsend S, Kingi P: **Why people gamble: a qualitative study of four New Zealand ethnic groups.** *Int J Ment Health Addiction* 2012, **10:**849–61. doi:10.1007/s11469-012-9380-7.
55. Petry NM: **Psychiatric symptoms in problem gambling and Non-problem gambling substance abusers.** *Am J Addict* 2010, **9:**163–171.
56. Sylvain C, Ladouceur R, Boisvert JM: **Cognitive and behavioral treatment of pathological gambling: a controlled study.** *J Consult Clin Psychol* 1997, **65**(5):727–32.
57. Toneatto T: **Cognitive psychopathology of problem gambling.** *Subst Use Misuse* 1999, **11:**1593–1604.
58. Ladouceur R, Sylvain C, Boutin C, Doucet C: *Understanding and treating pathological gamblers.* London: Wiley; 2002.
59. Ladouceur R, Sylvain C, Boutin C, Lachance S, Doucet C, Leblond J: **Group therapy for pathological gamblers: a cognitive approach.** *Behav Res Ther* 2003, **41**(5):587–596.
60. Toneatto T, Ladoceur R: **Treatment of pathological gambling: a critical review of the literature.** *Psychol Addict Behav* 2003, **17**(4):284–292.
61. Petry NM, Ammerman Y, Bohl J, Doersch A, Gay H, Kadden R, Molina C, Steinberg K: **Cognitive-behavioral therapy for pathological gamblers.** *J Consult Clin Psychol* 2006, **74**(3):555–567.
62. Ladouceur R, Lachance S: *Overcoming pathological gambling.* Therapist guide. N.Y.: Oxford University Press; 2007.
63. European commission: *Commission sets out an action plan for online gambling;* 2012. http://europa.eu/rapid/press-release_IP-12-1135_en.htm?locale=en.
64. Blaszczynski A, Ladouceur R, Shaffer HJ: **A science-based framework for responsible gambling: the Reno model.** *J Gambl Stud* 2004, **20:**301–317.
65. Griffths M: **Gambling technologies: prospects for problem gambling.** *J Gambl Stud* 1999, **15:**265–283.
66. Cox BJ, Yu N, Afifi T, Ladouceur R: **A national survey of gambling problems in Canada.** *Can J Psychiatry* 2005, **50:**213–217.
67. Parke J, Griffths M: **The psychology of fruit machine: the role of structural characteristics (revisited).** *Int J Ment Heal Addict* 2006, **4:**151–179.
68. Marshall D: **Gambling as a public health issue: The critical role of the local environment.** *Journal of Gambling Issues* 2009:66–80.
69. Adams PJ, Raeburn J, De Silva K: **A question of balance: prioritizing public health responses to harm from gambling.** *Addiction* 2009, **104:**688–691.
70. Caraniche Pty Ltd (Caraniche): *Evaluation of Electronic Gaming Machine Harm Minimisation Measures in Victoria.* Melbourne: Department of Justice (Victoria); 2005.
71. Abbot MW, Volberg A: **The measurement of adult problem and pathological gambling.** *Int Gambl Stud* 2006, **6**(2):175–200.

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III

Internet-based 8-week cognitive therapy for gambling problems: socio-demographic characteristics of the participants

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Abstract

This article describes 471 (325 males and 146 females) help seeking gamblers' socio-demographic characteristics, as well as, mood, alcohol consumption, the level of gambling related problems, gambling related thoughts, urge, impaired control and social consequences of gambling at the time of signing up for an Internet-based 8-week cognitive behavioral therapy for gamblers. 64 % of the participants were pathological gamblers (NODS>/=5 points), 14.8% were problems gamblers (NODS=3-4 points) and 10 % had risky gambling habits (1-2 points). Statistically significant ($p<.001$) gender specific differences in this sample were: age, onset age, length of time gambled, alcohol use (AUDIT-C), depression (MARDS-S). Urge to gamble and impaired control were the strongest predictors for gambling related problems in this sample.

During the recent years, different forms of gambling have increased throughout the world. This trend concerns the health care specialists as gambling problems are known to be the cause of many social, economical and health related problems. In the Nordic countries, the lifetime prevalence rates of pathological gambling (PG) are as follows: Sweden - 1.2 % (SOGS-R: Ronnberg et al. 1999); Norway - 0.6% (NODS: Lund et al. 2003); Denmark - 0.3% (NODS: Bonke, et al. 2006); Iceland - 0.6 % (DIGS: Abbot et al. 2006); and Finland - 1.6 % (SOGS: Aho et al. 2007). With such high prevalence rates, there is an urgent need to develop effective treatment options for PG.

It has been reported that less than 10 % of pathological gamblers seek treatment for their gambling problems (Cunningham, 2005; Productivity Commission, 2010; Slutske, Blaszczynski, & Martin, 2009) or receive the treatment only due to major life crises (Clarke, Abbott, De Souza, & Bellringer, 2007). One of the most promising new methods

for the treatment of PG is Internet-based therapy. Global access to Internet is relatively good and thus via Internet, health care specialists can reach many of those problem gamblers who would not be reached otherwise. As in Finland the population is widely spread throughout the country and there is a limited amount of treatment facilities and face-to-face services provided for Finnish problem gamblers Internet-based therapy is a promising therapeutic alternative for the treatment of PG's in Finland. Studies have shown that Internet-based educational information and self-help programs are usually as good as the traditional options (such as, face-to-face therapy, brief interventions and self-help) for the treatment of mental health problems (Barak et al. 2008; Bennett & Glasglow, 2009; Cuijpers, van Straten, & Andersson, 2008). Internet therapy has certain benefits as compared to the traditional therapeutic methods such as good availability and accessibility, cost-effectiveness, anonymity and privacy. The last two are especially relevant for those who seek help for addictions, but are not willing to participate into traditional face-to-face services (Monaghan & Blaszczynski, 2009a,b). Internet therapy seems to increase the treatment uptake and retention within populations that have low-treatment seeking and high attrition rates (Cunnigham, 2007, Gainsbury & Blaszczynski 2011). In addition to this, Internet therapy is easier for the patient than face-to-face treatment because there is no direct personal contact allowing individual to avoid encountering the shame or guilt that might be related to disclosing the presence of disorder, missing appointments or dropping out of the treatment.

The results of evidence based randomized and controlled trials suggest that cognitive, behavioural and cognitive behavioural therapy (CBT) seem to be the most effective psychotherapeutic treatment options in the treatment of gambling problems (Grant & Potenza, 2007; Ladouceur & Sylvain et al. 2001; Sylvain, Ladouceur & Boisvert 1997; Toneatto & Ladouceur, 2003; Ladouceur & Walker, 1996; PGRTC, 2011). All of these treatments are cost effective and have long-lasting advantages. Gainsbury et al. (2011) reviewed the Internet therapies for the addictions and found that most commonly used approaches in Internet therapies were: CBT (Abroms et al. 2008; Brendyen et al. 2008; Calrbring & Smit, 2008; Japuntich et al. 2006) and therapy via telephone during the course of Internet therapy (Brendyen et al. 2008; Calrbring & Smit, 2008; Mermelstein & Turner, 2006). Also, other methods and information was provided: psycho-education, interactive tools and practical strategies (Carlbring & Smit 2008; Japuntich et al. 2006; Zbikowski et al. 2008); email support (Abroms et al. 2008; discussion group or peer group (Japuntich et al. 2006; Zbikowski et al. 2008); email support (Hotta et al. 2007); information to assist in quitting (Brendyen et al. 2008; Carlbring & Smit 2008; Japuntich et al. 2006; Hotta et al. 2007; Mermelstein & Turner, 2006; Zbikowski et al. 2008); MI (motivational Interviewing) strategies (Hotta

et al. 2007; Mermelstein & Turner, 2006; Woodruff et al. 2007); behavioural approaches (Woodruff et al. 2007); systematic weekly telephone counseling calls as a part of the treatment (Carlbring & Smit, 2008). Carlbring et al. (2008) found that 8-week Internet-based CBT with minimal therapist contact via email and weekly telephone calls resulted favorable changes/reduction in pathological gambling, anxiety, depression and quality of life.

This article describes the characteristics of Finnish problem gamblers that participated into an Internet-based CBT intervention Peli Poikki (PP-program). PP-program is based on relatively similar components than the intervention studied by Carlbring et al. (2008). Similarities of PP-program to the intervention studied by Carlbring et al. (2008) are the length and the CBT-components of the program with the therapist help, measure of depression and the severity of gambling. Carlbring et al's study differs from this study by measure of anxiety and quality of life as well as wait-list comparison group. As suggested by Gainsbury & Blaszczynski (2011) there is a growing demand from consumers, treatment providers, policymakers and funding bodies to develop and utilize brief Internet based self-help programs to address gambling related problems. This article describes the socio demographic characteristics of gamblers who are seeking help via Internet therapy. In addition to socio economic characteristics, this article describes the participants mood, alcohol consumption, severity of gambling related problems, gambling related thoughts, urges and impaired control and social consequences of gambling. This article is based on data collected between 2007 and 2011 from the participants of the PP-program. This study was approved by National Institute for Health and Welfare Ethics Committee (§378/2011).

Method

Research Design

The only online recruitment criterion for the participants was that individuals were seeking help via the PP-program. The data collection started at the time the participant enrolled into the PP-program via PP-programs Internet site (e.g. www.peluuri.fi; http://infostakes.fi; http://www.pelipoikki.fi). For example, Peluuri's site that offers help line services, e-information about gambling, online-discussion groups for both gamblers and the significant others, recorded 5667 different visits in year 2011 (Pajula, 2011). During the enrollment, the participant's also filled in an informed consent concerning their participation to the study. Those

participants who scored 20 points or higher in the Montgomery Åsberg Depression Rating Scale (MADRS-S)(Montgomery; Åsberg, 1979) were advised via email to consult with a mental health professional for more help, yet they were not excluded from the program.

Sample and Participant Selection

A total of 471 individuals (325 males and 146 females) signed into the PP-program between September 2007 and May 2011.

Treatment and Measures

The PP-program is an internet-based self-help program (with telephone support) for problem and pathological gamblers, which was first developed in Sweden (Bergström et al. 2007). The 8-week CBT-based program consists of weekly modules, homework assignments, and a maximum of 30 minutes of weekly telephone support (with the exception of a one-hour call at first contact and at the end of the program). The total time spent in telephone contact with each participant will be 5 hours (2 x 1 hour and 6 x 30 minutes) over the whole course of the treatment. Participation in an online discussion group is voluntary. The participants will be receiving reading material and homework via Internet and they will be asked to complete the homework before speaking with the therapist or posting their comments on the discussion forum. The treatment consists of the following components: (1) psycho-education and enhancement of motivation by Miller (1983); (2) CBT for six weeks and (3) relapse prevention. Each module includes information, homework and small exercises, such as small essay assignments and yes/no questions. Homework will be allocated weekly as will be the time for telephone support. The purpose of the telephone support is to offer the participants a forum for addressing any questions about the modules and to encourage the participants to continue their change. Each participant will be given telephone support in a weekly basis. Participants will be asked if they had completed the weekly homework; if they have not done so, the reason will be asked and the participants will be encouraged to continue for a few more extra days, until they could access the next module. The continuation of the program is not possible without successfully completing the module on hand first. The therapist role is to go through the assigned homework and assign the next module for the following week. The following measures were used to explore the specific characteristics of individuals that were seeking help via Internet-based therapy at the baseline stage.

The questionnaire used in this study included the following sections: (1) Socio-demographic data; (2) The NORC SDM Screen for Gambling Problems, NODS, (Gerstein, D.; Hoffman, J.; Larison, C. et al. (1999) Sums of 17-items were computed, maximum points was 10 points, where 0 point=no gambling problem; 1-2 points=risky gambling habits; 3-4=problem gambling; 5-10 points=PG. NODS scores of past two months were used in analyses being more representative of the resent past compared to past year. ; (3) the main gambling types (9 different types: slot machines (Ray), betting games both in paper and Internet (Veikkaus, Finnish National betting agency)), on-track horse racing (Fintoto, Finish horse race betting agency), Internet poker (Paf and International websites), Internet poker (Ray, Finland's Slot Machine Association), other internet gambling, Casino, other gambling, Internet games, but not gambling; (4) 4 questions of wagering: money wagered per gambling in one week over the past month and year; money wagered in each gambling session over the past month and year, (5) the patient-administered version of the MADRS-S, (Montgomery; Åsberg, 1979). (6) and the 3-item Alcohol Use Identification Test AUDIT-C, (Bush et al. 1998). (7) 14 questions about social consequences (5-point Likert-scale, where 1=very negatively to 5=very positively). Mean scores were computed. Cronbach's Alpha 0.89 (8) 4 questions of impaired-control (5-point Likert-scale, where 1=never to 5=always)) (a) Have you sometimes felt that you are like in a 'trans', while you gamble?; (b) Have you sometimes felt that you are like another person while you gamble?; (c) Have you sometimes lost control of time while you gamble?; (d) Have you sometimes experienced that you had difficulties to recall what had happened while you gambled? Mean scores were computed. Cronbach's Alpha 0.86. (9) 3 questions about gambling urge (10-point Likert-scale). One question was used: How strong is your gambling urge, when it is at its strongest? (10-point Likert-scale where 1=weak gambling urge to 10=strong gambling urge). This question was chosen of three, being most representative question. There was a significant negative correlation between question 1 and 3 ($r=-.212$, 439, $p<0.01$, two tailed). (10) 14 questions about gambling related thoughts (yes/no-answers). Sums were computed. Cronbach's Alpha was 0.69.

Results

The mean age of the participants was 34.5 years (SD=11.8). The mean age at the onset of gambling was 23.3 years (SD=12.2). Males (M=20.1, SD=9.55) started gambling significantly earlier than females (M=30.6, SD=14.38, t=-9.344, df=462, p<.001). With respect to the highest attained educational level, 41.6% of the participants had completed high school, 15.5% had a bachelor's degree, 14.4% a middle school education, 12.1% a vocational college degree and 11.9% a masters or higher level university degree, and 3.1% of participants an elementary school education. With regards to employment, 64.9% of participants were employed and working full time, 9.8% were unemployed, 8.6% were students, and 1.9% were retired, while the remainder were either on early retirement, on long-term sick leave, a housewife/househusband, on parental leave, or reported their employment status as other.

Characteristics and gender differences

Characteristics of the sample and gender differences within all measured variables are shown in Table 1. Females that enrolled into this program were older than males. The mean age of females was (M=40.1, SD=14.2) where the males ages were (M=32.0, SD=9.73). Males seemed to start gambling at younger age (M=2011, SD=9.55) than females (M=30.69, SD=14.37). Males had also gambled longer (M=11.96, SD=7.50) than females (M=9.17, SD=7.37).

Gambling related problems (NODS)

Females seemed to have slightly more or more severe gambling related problems (NODS) during the time for past two months (M=5.53, SD=2.96)) than males (M=3.54, SD= 2.68). However, ANOVA test showed no statistically significant differences in gambling related problems between the genders. According to the results, the level of gambling related problems as measured by NODS was as follows: total of 459 participants 32 (6.7 %) had no gambling problems; 48 (10.0 %) participants had risky gambling habits; 71 (14.8%) were problem gamblers and; 308 (64.0 %) were pathological gamblers. Gender specific differences are shown in Table 2.

Table 1. Individual characteristics as a percentage of the total sum, means and standard deviations of the variables.

Characteristics	Male		Female	
Female				
Age				
M (SD)	32.03	(9.73)	40.19	(14.17)
N (%)	323	(64)	145	(36)
Onset age				
M, (SD)	20.11	(9.55)	30.69	(14.37)
N (%)	321	(59.5)	143	(40.5)
Length of gambling (Years)				
M, SD,	11.92	(7.50)	9.17	(7.37)
N (%)	320	(74.4)	143	(25.6)
NODS[1] past 2 months				
M, SD,	5.53	(2.96)	5.93	(2.68)
N (%)	311	(67.7)	142	(32.3)
MARDS				
M, SD	14.70	(8.81)	16.66	(8.71)
N (%)	319	(66.3)	143	(33.7)
Audit-C				
M, SD	8.92	(2.09)	7.39	(2.26)
N (%)	284	(73.6)	123	(26.4)
Erroneous thoughts				
M, SD	5.21	(2.87)	4.67	(2.56)
N (%)	286	(70.7)	132	(29.3)
Urge				
M, SD	8.86	(1.29)	8.86	(1.27)
N (%)	295	(68.1)	138	(31.9)
Control				
M, SD	2.28	(1.02)	2.45	(1.12)
N (%)	293	(66.4)	138	(33.6)
Social consequences				
M, SD	2.15	(0.53)	2.10	(0.44)
N (%)	295	(68.6)	138	(31.4)

[1] NODS past 2 months, continuous variable.

Table 2. Four categories of NODS scores and percentages in each category with gender differences.

	Score	N	%
NODS Males	0	29	9.3
	1-2	31	10.0
	3-4	43	13.8
	5-10	208	66.9
Total		311	
NODS Females	0	2	1.4
	1-2	17	12.0
	3-4	26	18.3
	5-10	97	68.3
Total		142	

Score: 0=no gambling problem; 1-2 risky gambling habits; 3-4=problem gambling; 5-10=PG

Depression and alcohol consumption

In exploring two rather commonly co-occurring conditions: depression and high level of alcohol consumption, the following results were found: the one-way ANOVA $F(1, 434) = 5.08$, $p<0.025$, demonstrated statistically significant differences in MARDS-S scores, indicating that females had higher level of depression ($M=16.6$, $SD=8.71$) than males ($M=14.70$, $SD=8.81$). Whereas, the one-way ANOVA $F(1, 406)=44.34$, $p<0.001$, demonstrated statistically significant differences in Audit-C scores, indicating that males ($M=8.92$, $SD=2.09$) consumed more alcohol than females ($M=7.39$, $SD=8.71$).

Note: Degrees of freedom varies due to responses provided by the participants.

Gambling related erroneous thoughts, gambling urge, impaired control and social consequences

The one-way ANOVA F(1, 417)=3.45, p<0.064, demonstrated statistically significant differences in gambling related erroneous thoughts, males (M=5.21, SD=2.87) presenting more gambling related erroneous thoughts than females (M=4.61, SD=2.56). Participants presented their gambling urges rather high and similar regardless of their gender. Males (M=8.86, SD=1.29), females (M=8.86, SD=1.27). Females had slightly lower level of control in a gambling situation than males: females (M=2.45, SD=1.12), males (M=2.28, SD=1.02). Yet, there were no significant differences in gambling control and gambling urge between the genders (Mann-Whitney-U-test). Similarly, there were no statistically significant differences in social consequences between the genders, but overall mean score reflected stronger than moderate level of disturbances in social life.

Gambling types

The most popular games among the participants were slot machines (57%), with males gambling slot machines significantly more than females (Chi Square=13.480, df=1, p<.001); second favorite games were betting games and the lotto by Veikkaus (Finnish National betting agency) (34.3%), with males betting significantly more often these than females (Chi Square=7.180, df=1, p<.01); and third miscellaneous internet games (30.1%), which showed no significant gender difference. The other reported games gambled were RAY (Finland's Slot Machine Association) Internet poker (19.7%), with males gambling significantly more often than females (Chi Square=20.429, df=1, p<.001). Following with gambling in the casino (11.3%), miscellaneous games (14.4%), Internet poker at PAF (Åland Island Slot Machine Association), and foreign Internet poker sites (5.6%), and on-track horse betting (4.2%). Most of the participants reported playing more than one type of game.

Wagers

The amount of money wagered for gambling (in Euro's) within (a) one week over past month: (M=305, 05, SD=765.5), money wagered per week during the past year (M=795.7, SD=390.2), money used for (b) each gambling session over past month was (M=148.5, SD=390.2), money wagered in each gambling session over past year (M=605, SD=5308.4). Mann-Whitney-U test showed no significant gender specific differences in this sample.

Overall, the amount of money wagered both in weekly and per session measures were relatively high with regards to this study's participants socio economic status. Also, the variance was relatively strong and could reflect significant economic disturbances for some participants.

Gambling related problems and Predictions of gambling related problems

Linear regression model was created in order to explore sets of variables that might contribute to the gambling related problems - NODS (see Table 3.) Model one showed that both gambling related erroneous thoughts and social consequences were contributing to the existence of gambling problems significantly as follows: Gambling related erroneous thoughts (β=.097, t=1.998, p<.05), as moderating gambling behavior and negative social consequences (β=-.241, t=-4.968, p<.001) due to gambling behavior. In model two, when co-occurring low mood / depression measure (MARDS-S) seemed to power over previous predictors significantly (β=.416, t=8.335, p<0.001), reflecting that depression might contribute to gambling problems in this sample. When gambling urge and impaired control were added to the model, still MARDS-S continued to be rather powerful predictor for gambling related problems, but those two new predictors gambling urge and impaired control seemed to explain gambling problems significantly as follows: MARDS-S (β=.312, t=6.331, p<.0019. Urge (β=0.184, t=3.820, p<.001). Impaired control (β=0.254, t=5.215, p<0.001). Overall, this model could explain 3.1 % of gambling related problems in this sample. R^2=0.319=3.1%.

Table 3. Predictors of gambling related problems.

Variable	Model 1 β	Model 2 β	Model 3 β
Constant	7.765	3.821	-1.498
Gender	0.066	0.014	-0.009
Time of gambling in years	0.012	-0.003	0.002
Gambling related erroneous thoughts	0.097*	0.053	-0.002
Social consequences			
MARDS	-0.241**	-0.077	-0.005
AUDIT-C		0.416**	0.312**
Urge		0.037	0.028
Impaired control			0.184**
R^2			0.254**
F	0.082	0.216	0.319
	9.117**	16.944**	21.274**

*p<.05.**p<.001.

Discussion

Among the 453 participants, 68.3 % of females and 66.9 % of males were identified as PG's and 69 participants, whereas 18.3 % of females and 13.8 % of males were identified as problem gamblers with a relatively low level of education. This is in line with the earlier findings that low economical status and unemployment may play a role in the development of PG (Petry, 2002). In this sample, the age of onset was relatively low; males started to gamble significantly earlier and had gambled longer than females.

Certain gender specific differences in gambling have also been found in earlier studies: men tend to start gambling at younger age and have more severe type of gambling problems than females (Granero et al. 2009; Crisp et al. 2004; Ladd & Petry, 2002; Grant et al. 2002; Tavares et al. 2001; Potenza et al. 2001; Cunningham-Williams et al. 1998; Lynch et al. 2004; Lahti et al. 2011). Studies have also shown that men tend to prefer the strategic games (poker and sport betting) whereas females prefer especially non-strategic games such as lotteries (Granero et al. 2009). These findings of earlier studies were not directly supported in this sample. Males gambled significantly more on slot machines, betting games (lotteries) and Internet-games than females. Our results revealed that the most popular game gambled by PP-program's participants were the slot machines. This finding seems to be in line with the annual statistical report of the Finnish gambling clinic (Jaakkola et al. 2011) as well as the report of the Peluuri, Finnish helpline for gamblers (Pajula et al. , 2011), with both stating that problem-gamblers have identified slot machines as the gambling type as the root of their problem. One reason may be that in Finland, slot machines are available in several venues, such as shops, kiosks, restaurants, gas stations, shopping centers, clubs and pubs; the sheer number of slot machines in Finland is also rather large, at approximately 20 000. Finland's policy towards the location of gambling machines is unique compared to several other EU countries, where slot machines are permitted only in casinos or in restricted gambling halls.

Participants rated betting, scratch-card lotteries and the lotto as their second favorite gambling type. The third favorite gambling type, in this sample, was internet-based casino gambling, which is again in line with Peluuris' report that internet gambling had increased. An analysis of gender differences showed that males gamble Internet games more than females. This reflects the findings of a Swedish longitudinal study, SWELOGS (2009), that reported that Internet poker had increased

rapidly in Sweden, especially among two groups of men (a) young men aged 18-24 and (b) men aged 24-44 years (Svensson, 2010). Interestingly, although gender specific profile showed alerting message about young males, being probably at greater risk with Internet gambling, yet characteristic profile shows that females who signed up for PP-program were older than males and had slightly higher scores in gambling related problems than males. Another noteworthy finding, with this sample, was the observation of rather high level of alcohol consumption, as a co-occurring condition, males presenting this problem significantly stronger than females. This notion is supported with similar findings by Rush et al. (2007). Hakkarainen et al. 2008 stated that intentional binge-drinking and increased levels of alcohol consumption increase the risk of problem gambling in a Finnish sample. While alcohol consumption is well researched in Finland and the health risk factors of Finns are also well known, the co-occurrence of alcohol consumption and gambling has not been sufficiently addressed. Both Hakkarainen's and our findings suggest that high alcohol consumption and problem gambling can be seen as co-occurring problems, although exactly how they relate to each other as life-limiting dependencies is not yet fully understood. It may be that one dependency provokes the other, or that the individual develops a problem while using the other activity as a coping mechanism.

In this study, gambling related problems were explained by gambling related erroneous thoughts, social consequences, depression, gambling urge and impaired control. The presence of gambling related cognitive erroneous thoughts was observed in this sample, males presenting more of those. Gambling related cognitive erroneous thoughts, for example, illusion of control and misperception of randomness and erroneous perceptions has been shown to have significant negative contribution to gambling activities (Langer, 1975; Ladouceur, 2004; Pelletier et al., 2007; Caron, et al., 2003; Toneatto et al., 1997; Toneatto et al., 2003; Rogers, 1998; Walker; 1985; Walker, 1992; Hill et al., 1998). Social consequences includes negative externalities, that are financial breakdown, impaired relationships with significant others, and can lead to individual's ill health, arrest and other illegal behaviors to finance gambling (Gerstein et al. 1999; Bergh et al. 1994). In this paper, social consequences were linked to gambling related problems, but only with rather weak association.

Previous studies have shown that signs and symptoms of pathological gambling start in early adulthood and have co-morbidity with other mental disorders and substance use disorders (Kessler et a. 2008). More specifically, severity of depressive symptoms is associated with the severity of gambling (Thomsen et al. 2009). In this sample, the participants in both genders reported rather high scores of depression. Depression was also rather strong predictor in our model in explaining gambling related problems.

Yet, depression was one rather strong contributor to the gambling related problems, in this sample, still gambling urge and impaired control seemed to explain the most of this sample's gambling related problems. Impaired control, especially on electronic gaming machines, has been suggested to link with excessive gambling, negative consequences after excessive gambling (Cantinotti et al. 2009). Whereas, gambling urge has been linked to psychological stress or specific stressful events in life (Elman et al. 2010; Tschibelu et al. 2011).

The profile of gamblers found in our Finnish sample suggests that especially young men could be at greater risk to develop more severe gambling problems due to early onset age, as well as both rather high level of alcohol consumption. Yet, it is noticeable that the females seeking help via Internet-based therapies are older than males. According to this sample, the individuals that seek help from Internet-based therapies present themselves rather depressed and use alcohol to the extent that it could be a problem as well. Rather unique finding in this explorative study was the types of money games Finns preferred, and that being slot machines for both genders. This finding could be explained by Finland's unique gambling policy, in particular, regarding the availability of slot machines. This finding regarding namely availability or accessibility risk ought to be taken seriously in Finland, since exposure to gambling venues have been found to have positive association with developing gambling problem (Rush et al. 2007).

In the near future, we also hope to contribute to another call, suggested by Gainsbury et al. (2011), that is to provide evidence for Internet-based treatments effectiveness and further identify which elements of Internet interventions are most effective, and how to improve features and tools to offer and tailor programs to fit the needs of individuals with gambling problem. Further study is planned using the PP-data, with a good sample size for relatively novel treatment mode that will shed light on PP-program's effectiveness as an Internet-based treatment for gamblers and also will give a chance to evaluate how it works in a clinical setting in practice.

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References

Abbott, M. V. & Volberg, R. A. (2006). The measurement of adult problem and pathological gambling. International Gambling Studies, 6, 175-200.

Abroms, L., Windsor, R., & Simons-Morton, B. (2008). Getting adults to quit smoking: A formative evaluation of the X-Pack Program. Nicotine & Tobacco Research, 10, 27-33.

Aho, P. Turja, T. (2007). Suomalaisten rahapelaaminen 200, (The gambling of the Finns 007). Helsinki: Taloustutkimus Oy.

Barak, A. Hen, L., Boniel-Nissim, M. & Shapira, N. (2008). A comprehensive review and meta-analysis of the effectiveness of Internet based psychotherapeutic interventions. Journal of Technology in Human Services, 26, 109-160.

Bennett, G.C., & Glasgov, R.E. (2009). The delivery of public health interventions via Internet: Actualizing their potential. Annual Review of Public Health, 30, 273-292.

Bergh, C. & Kuhlhorn, E. (1994). Social, psychological and Physical Consequences of Pathological Gambling in Sweden. Journal of Gambling Studies 10(3), 275-285.

Bergström, M., & Lundgren, R. (2007). Utvärdering av Internetbaserat självhjälpsbehandling I combination med telefonstöd vid spelmani. (Unpublished master's thesis). Lindköping, Lindköpings Universitet.

Bonke, J. & Borregaard, K. (2006). Ludomani i Danmark: Udbredelsen af pengespil og problemspillere, (Pathological gambling in Danmark: Prevalence of gambling and pathological gamblers). Copenhagen, Socialforskningsinstituttet.

Brendryen, H., Drozd, F., & Kraft, P. (2008). A digital smoking cessation program delivered through Internet and cell phone without nicotine replacement (happy ending): Randomized controlled trial. Journal of Medical Internet Research, 10, e51.

Bush, K., Kihlavan, D.R., McConell, M.B., Fihn, S.D., & Bradley, K.A. (1998). The AUDIT alcohol consumption questions (AUDIT-C): An effective brief screening test for problem drinking. Arch. Intern. Med. 158, 1789-1795.

Cantinotti, M. , Ladouceur, R., & Jaques, C. (2009). Lay and scientific conceptualizations of impaired control at electronic gambling machines. Addiction Research, 17, 650-667.

Carlbring, P., & Smit, F. (2008). Randomized trial of Internet-Delivered Self-Help With Telephone Support for Pathological Gamblers. Journal of Consulting and Clinical Psychology,6, 1090-1094.

Caron, A., & Ladouceur, R. (2003). Erroneous verbalizations and risk taking at video lotteries. British Journal of Psychology, 94, 189-194.

Clarke, D., Abbott, M., & DeSouza, R, & Bellringer, M. (2007). An overview of help seeking by problem gamblers and their families including barriers to and relevance of services. International Journal of Mental Health and Addictions, 5, 292-306.

Cuijpers, P, van Straten, A., & Andersson, G. (2008). Internet administered cognitive behavior therapy for health problems: A systematic review. Journal of Behavioral Medicine, 31, 169-177.

Crisp, B.R., Thomas, S.A., Jackson, A.C., Smit, S., Borrell, J., Ho, W.Y., Holt, T.A., Thomason, N. (2004). Not the same: A comparison of female and male clients seeking &treatment from gambling problem gambling counseling services. Journal of Gambling Studies/Co-Sponsored by the National Council on Problem Gambling and Institute for the Study of Gambling and Commercial Gaming, 20, 283-299. doi:10.1023/B:JOGS.0000040280.64348.d1

Cunningham-Williams, R.M., Cottler, L.B., Compton, W.M., & Spitznagel, E.L. (1998). Taking chances: Problem gamblers and mental health disorders results from st. luis epidemiologic catchment area study. American Journal of Public Health, 88(7), 1093-1096.

Cunningham, J.A. (2005). Little use of treartment among problem gamblers. Psychiatric Services, 56, 1024-1025.

Cunningham, J.A. (2007). Internet-based Interventions for Alcohol, Tobacco and Other Substances of Abuse. In P. Miller & D. Kavanagh (EDS.), Translation of addictions science into practice (pp. 399-438). New York: Elsevier-Pergmon.

Elman, I., Tschibelu, E., & Borsook, D. (2010). Psychosocial stress and its relationship to gambling urges in individuals with pathological gambling. The American Journal of Addictions, 19(4), 332-339.

Gainsbury, S., & Blaszczynski, A. (2011). Online Self-guided Interventions for the Treatment of Problem Gambling. International Gambling Studies, 11, 289-308.

Gainsbury, S. & Blaszczynski, A. (2011). A systematic review of internet-based therapy for the treatment of addictions, Clinical Psychology review, 31(3), 490-498.

Gerstein, D., Hoffmann, J., Larson, C. et al. (1999). Gambling Impact and Behavior Study, (Report to The National Gambling Impact Study Commission). Chicago, National Opinion Research Center at the University of Chicago.

Granero, R., Penelo, E, Martinez-Gimenez, R., Alvarez-Moya, E., Gomes-Pena, M., Aymami, M.N., Bueno, B., Fernandez-Aranda, F., Jimenez-Murzia, S. (2009). Sex differences among treatment seeking adult pathological gamblers. Comprehensive Psychiatry, 59(2), 173-180.

Grant, J.E., & Potenza, M. (2007). Treatments for pathological gambling and other impulse control disorders. In P.E. Nathan & J.M. Gorman (Eds.), A guide to treatments that work (3rd ed., pp.561-577). New York: Oxford University Press.

Hakkarainen, P., Järvinen-Tassopoulos, J., & Metso, L. (2010). Miten alkoholinkäyttö, rahapelaaminen ja huumeidenkäyttö kytkeytyvät toisiinsa? in Mäkelä, P., Mustonen, H. Tigerstedt, C. Eds. Suomi juo Suomalaisten alkoholinkäyttö ja sen muutokset 1968-2008 (pp.264-279). National Institute for Health and Welfare, Helsinki.

Hill, E., & Williams, S. (1998). Choose six numbers, any six numbers. The Psychologist, 17-21.

Hotta, K., Kinumi, K., Naito, K., Kuroki, K., Sakane, H., Imai, A. et al. (2007). An intensive group therapy programme for smoking cessation using nicotine patch and internet mailing supports in a university setting. international Journal of Clinical Practice, 61, 1997-2001.

Jaakkola, T., & Murto, A. (2011). Peliklinikka, Toimintakatsaus, Väliraportti, (Report: Half year). (Unpublished report). Helsinki, Peliklinikka.

Japuntich, S. Zehner, M.E., Smith, S.S., Jorenby, D.E., Valdez, J.A., Fiore, M.C., et al. (2006). Smoking cessation via internet: A randomized clinical trial of an internet intervention as adjuvant treatment in a smoking cessation intervention. Nicotine & Tobacco Research, 8 (Suppl. 1), S559-S67.

Kessler, R., Hwang, I., LaBrie, R., Petukhova, M., Sampson, N.A., Winters, K.C., & Shaffer, H.J. (2008).The prevalence and correlates of DSM-IV Pathological Gamblingin the National Comorbidity Survey Replication. Psychol.Med. 38,(9), 1351-1360. doi:10.1017/S0033291708002900

Ladd, G.T., & Petry, N.M. (2002). Gender differences among pathological gamblers seeking treatment. Experimental and Clinical Psychopharmachology, 10, 302-309.

Ladouceur, R., & Walker, M.A. (1996). A cognitive perspective on gambling. In Salkovskis PM, (Eds.), Trends in cognitive therapy. Oxford, UK Wiley, p. 89-120.

Ladouceur, R., Sylvain, C., Boutin, C., Lachance, S., Doucet, C., Leblond, J., & Jaques, C. (2001). Cognitive treatment of pathological gambling. Journal of Nervous and Mental Disease, 189, 774-780.

Ladouceur, 2004. Gambling the hidden addiction. The Canadian Journal of Psychiatry, 49, (8), 501-503.

Langer, E. (1975). The Illusion of Control. Journal of Personality and Social Psychology,32,(2), 311-328.

Lahti, T., Halme, J. Pankakoski, M., Sinclair, D. Alho, H. (2010). Treatment of Pathological Gambling with Naltrexone Pharmacotheraphy and Brief Intervention: A Pilot Study. Psychopharmacology Bulletin, 3, 35-44.

Lepage, C., Ladouceur, R., & Jaques, C. (2000). Prevalence of problem Gambling Among Community Service Users. Community Mental Health Journal, 6, 597-601.

Lund, I. & Nordlund, S. (2003). Pengespill og pengespillproblemer I Norge. (Money gambling in Norway). Sirus report 2/2003 Oslo, Norwegian Institute for Alcohol and Drug Research.

Lynch, W.J., Maciejewski, P.K., Potenza, M.N. (2004). Psychiatric correlates of gambling in adolescents and young adults grouped by age and at gambling onset. Archives of General Psychiatry, 61(11), 1116-1122.

Mermelstein, R., & Turner, L. (2006). Web-based support as an adjunct to group-based smoking cessation for adolescents. Nicotine & Tobacco Research, 8 (Suppl. 1), S69-S76.

Miller, W. R. (1983). Motivational interviewing with problem drinkers. Behavioural Psychotherapy, 11, 147-172.

Monaghan, S., & Blaszczynski, A. (2009a). Internet-based interventions for treatment of problem gambling. Toronto : Centre for Addiction and Mental Health.

Monaghan, S., & Blaszczynski, A. (2009b). Internet therapy for problem gambling : A Literature review and environmental scan. Final report prepared for Ontario Problem Gambling Research Centre, Guelph, Ontario Canada.

Montgomery, S.A., & Asberg, M. (1979). A new depression scale designed to be sensitive to change. Br J Psychiatry, 134: 382-9.

Pajula, M. & Aaltonen, A. (2011). Peluuri Puolivuosiraportti. (Report, half year), (Unpublished report). Helsinki: Peluuri.

Pelletier, M-F., & Ladouceur, R. (2007). The effect of knowledge of mathemathics on gambling behaviors and erroneous perceptions. International Journal of Psychology, 42(2), 134-140.

Petry, N. (2002). A comparison of young, middle-aged, and older adult treatment seeking pathological gamblers. The Gerontologist, 42 (1), 92-99.

Problem Gambling Research and Treatment Centre (PGRTC)(2011). Guideline, assessment and treatment in problem gambling. Clayton : Monash University.

Potenza, M.N., Steinberg, M.A., McLaughlin, S.D., Wu, R., Rounsaville, B.J., &O'Malley, S.S. (2001). Gender-related differences in the characteristics of the problem gamblers using gambling help line. The American Journal of Psychiatry, 158 (9), 1500-1505.

Productivity Commission (2010). Gambling: Final report. Australia: Canberra.

Rogers, P. (1998). The cognitive psychology of lottery gambling: A theorethical review. Journal of Gambling Studies, 14 (2), 111-134.

Rush, B., Veldhuizen, S., & Adlaf, E. (2007). Mapping the prevalence of problem gambling and its association with treatment accessibility and proximity to gambling venues. Journal of Gambling Issues, 20, 193-214.

Rönnberg, S., Volberg, R. Abbott, M. Moore, L., Andén, A., Munck, I. et al. (1999). Spel och spelberoende I Sverige (Gambling problems in Sweden), (Report No.3 I). Stockholm, Fölkhäsoinstitutet.

Slutske, W.S., Blaszczynski, A., & Martin, N.G. (2009). Sex differences in rates of recovery, treatment seeking, and natural recovery in pathological gambling: results from Australian community-based twin survey. Twin Research and Human Genetics, 12, 425-332.

Statens Folkhälsoinstitutet (2010). Internetbaserat självhjäpsprogram för spelberoende, Slutrapport (Report No. 2011:11). Sverige, Statens folkhälsoinstitutet.

Statens Folkhälsoinstitutet (2010). Spel om pengar och spelproblem I Sverige 2008-2009. Huvudresultat från SWELOGS befolkningstudie, SWELOGS, Swedish longitudinal Gambling Study, (Report No. 2010:23). Östersund: Statens Folkhälsoinstitutet.

Svensson, J. (2010). Online gambling in Sweden and EU: Some possible implications for the Australian Productivity Commission. Retrieved from The Gambling and Public Health Alliance International website: http://www.gaphai.org/wp-content/uploads/Newsletter-April-20101.pdf

Sylvain, C., Ladouceur, R., & Boisvert, J. -M. (1997). Cognitive and behavioral treatment of pathological gambling:a controlled study. Journal of Consulting and Clinical Psychology, 65, 727-732.

Tavares, H., Zilberman, M.L., Beites, F.J. & Gentil, V. (2001). Gender differences in gambling progression. Journal of Gambling studies/ Co-Sponsored by the national Council of Problem Gambling and Institute for the Study of Gambling and Commercial Gaming, 17(2), 151-159.

Thomsen, R., Callesen, M.B., Linnet, J., Kringelbach, M.L., & Moller, A. (2009). severity of gambling is associated with severity of depressive symptoms in pathological gamblers. Behav. Pharmacol. 20, (5-6-), 527-536.

Toneatto, T., Bliz-Miller, T, Calderwwod, K., Dragonetti, R., Tsanos, A. (1997). Cognitive distortions in heavy gambling. Journal of Gambling Studies, 33, 253-266.

Toneatto, t., & Ladouceur, R. (2003). Treatment of pathological Gambling : A Critical Review of the Literature, Psychology of Addictive Behaviors, 17 (4) 284-292.

Tschibelu, E, & Elman, I. (2001). Gender Differences in Psychosoacial Stress and in Its Relationship to Gambling Urges in Individuals with Pathological Gambling. Journal of Addictive Diseases, 30 (1), 81-87.

Walker, M. (1985). The psycholgy of everyday gambling. Oxford, Butterworth-Heinemann.

Walker, M. (1992). The psychology of gambling. Oxford, Butterworth-Heinemann.

Woodruff, S.I., Conway, T., L., Edwards, C.C., Elliott, S.P., & Crittenden, J. (2007). Evaluation of an internet virtual world chat room for adolescent smoking cessation. Addictive Behaviors, 32, 1769-1786.

Zbikowski, S.M., Hapgood, J., Smucker Barnwell, S., & McAfee, T. (2008). Phone and web-based tobacco cessation treatment: Real-world utilization patterns and outcomes for 110,000 tobacco users. Journal of Medical Internet Research, 10, 55-67.

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IV

Personality and Social Psychology

Internet-based CBT intervention for gamblers in Finland: Experiences from the field

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From September 2007 to May 2011 a total of 471 participants (325 males and 146 females) signed up for an 8-week Internet-based cognitive behavioral therapy offered for gamblers in Finland. Sixty-four percent of the participants were pathological gamblers (PGs) (NODS 5> points), 14% were problem gamblers (NODS 3–4 points) and 10% were at risk of gambling problems (NODS 1–2 points). Two hundred and twenty four participants completed the treatment and after the treatment period significant changes were found in the following variables: gambling related problems (NODS), gambling urge, impaired control of gambling, alcohol consumption (AUDIT-C), social consequences, gambling-related cognitive erroneous thoughts and depression (MARD-S). In this sample co-morbid alcohol consumption was stronger among males. The main finding of this study was that the onset age of gambling was associated with a greater amount of gambling-related cognitive erroneous thoughts.

Key words: Gambling, gambling urge, impaired control of gambling, gambling-related cognitive erroneous thoughts, comorbid alcohol use, depression, internet-based therapy.

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INTRODUCTION

The thoughts of problem gamblers and pathological gamblers are tuned towards monetary wins. These gambling-related cognitive erroneous thoughts include thoughts such as "I will beat the system" or "I cannot stop yet, jackpot is just behind the corner." The contents of the erroneous thoughts increase the gamblers' urge to gamble, thus causing their control in a gambling situation to become impaired. Impaired control can lead to various detrimental consequences in gamblers' lives. Problems caused by gambling can easily accumulate and spread to various areas of individuals' lives.

In Finland the prevalence rate of problem gambling is approximately 2.7% (South Oaks Gambling Screen, Revised, SOGS-R 3+ points) while the pathological gambling (PG) rate is at 1% (SOGS-R 5+ points) (Turja, Halme, Mervola, Järvinen-Tassopoulos & Ronkainen, 2012). With such high prevalence rates, there is an urgent need for health care providers to establish efficient treatment options for PG.

Internet-based psycho-educational health information and self-help programs have been recognized as equally effective treatment options for mental health problems as traditional face-to-face counseling, and brief interventions (Barak, Hen, Boniel-Nissim & Shapira, 2008: Bennett & Glasgov 2009; Cuijpers, van Straten, & Andersson 2008). Availability, cost-effectiveness, anonymity and privacy are benefits of Internet-based therapies. Furthermore, Internet-based therapy increases the treatment uptake and retention rates (Cunningham, 2007: Gainsbury & Blaszczynski, 2011a). When combined with cognitive behavioral therapy (CBT) (Grant & Potenza, 2007; Ladouceur, Sylvain, Boutin *et al*. 2001; PGRTC, 2011; Sylvain, Ladouceur & Boisvert, 1997; Toneatto & Ladouceur, 2003), Internet-based therapy offers help to many individuals suffering from a variety of gambling problems.

The most commonly used intervention in Internet-based therapy for addictions is CBT (Gainsbury & Blaszczynski, 2011b). Also, PGRTC Problem Gambling Research and Treatment Centre (PGRTC) (2011) recommends CBT to be used as the primary treatment option for both problem gambling and more severe PG. In 2008, Carlbring and Smit (2008) found that 8-week Interned-based CBT intervention significantly increased non-depressed participants' quality of life, especially by reducing participants' anxiety and improved their quality of life after the treatment period. In 2007, Peluuri, a Finnish non-profit organization for gamblers, adapted an Internet-based 8-week cognitive therapy-based self-help program (with telephone therapist support) from Spelinstitutet, Sweden, developed by Bergstom & Lundgren, 2007. Program is called Peli Poikki- Program (PP-program). However, the PP-program differs from Carlbring and Smit's (2008) preliminary study by also including depressed participants. Recently, Carlbring, Degerman, Jonsson and Andersson's (2012) study included participants with depression and found reductions in pathological gambling, anxiety as well as depression and improvement in quality of life.

For this study we used data collected from the participants of the PP-program between September 2007 and May 2011. This paper aims to (1) to share practical experience from the field, namely how Internet-based therapy works in practice, and (2) to explore the impacts of the offered therapy for gambling-related

problems, gambling urge, impaired control of gambling, gambling-related erroneous thoughts, social consequences of gambling, the level of alcohol consumption and depression.

METHODS

Research design

All individuals seeking help via the PP-program were recruited for the study. No other inclusion or exclusion criteria were applied. All participants gave an informed consent in the beginning of the study via an online recruitment form. Before starting the data collection, the study was approved by the ethics committee (§378/2011) of the National Institute for Health and Welfare.

Self-report questionnaires were sent to and returned by the participants at the baseline of the study and after completing the 8-week program (post-treatment). Follow-up questionnaires were sent to the participants after 6- and 12-months of the treatment to monitor the long-term effects of the intervention. Participants scoring 20 points or higher in the Montgomery Åsberg Depression Rating Scale (MADRS-S) (Montgomery & Åsberg, 1979) were advised via email to consult a mental health professional for more help.

Participants

Four hundred and seventy-one participants started the program (325 males and 146 females) and completed it between September 2007 and May 2011.

Therapists

Four trained therapists were responsible for the treatment offered during PP-program. The therapists were trained in the use of the PP-program's manual before starting the study.

Sampling procedures

The PP-program was advertised via Finnish gambling websites and helplines (e.g. www.voimapiiri.fi; http://infostakes.fi; http://www.peliPoikki.fi). All problem gamblers seeking help via the PP-program could register for free as participants.

Treatment

The PP-program lasted 8-weeks during which the participants accessed weekly modules, getting homework assignments, and a maximum of 30 minutes of weekly telephone support (with the exception of a one-hour call at first contact and at the end of the program). The total time spent in telephone with each participant was 5 hours (2 x 1 hour and 6 x 30 minutes) over the whole course of the treatment. The participants could also voluntarily participate in an online discussion group. The treatment consisted the following eight modules:

(1). Psycho education and enhancement of motivation by Miller (1983): This reading material promoted participants' awareness about the ambivalence concerning their gambling behavior and enhanced their motivation for both change and setting goals for the treatment.
(2). Recognition of high-risk situations and triggers that might provoke gambling: Reading material offered information about automatic thoughts, especially negative automatic thoughts that may be provoked by stressful situations in life. Through homework the participants were asked to identify gambling related situations, thoughts, feelings, behaviors and consequences of their gambling related behaviors. Additionally, participants practiced alternative ways to manage their economy.
(3). Identification of social consequences of gambling: Significant others were interviewed about the participants' gambling. The participants also set the goals for change.
(4–5). Recognition of gambling related erroneous thoughts and their role in gambling situations: The participants learned to recognize gambling related thoughts that lead to excessive gambling. The participants also practiced acceptance of the present situation intending to help them to focus on setting goals for the future.
(6–7). Participants identified the high-risk situations triggering gambling behavior and practiced safer ways to respond to and behave in these high-risk situations. The participants also continued practicing weekly how to better manage their economy.
(8). Relapse prevention: the participants made a clear prevention plan in case a relapse occurs after the treatment.

Each module included information, homework and exercises such as small essay assignments and yes/no questions. Homework was allocated weekly as well as the time for telephone support. The purpose of the telephone support was to offer the participants a forum for addressing any questions about the modules and to encourage the participants to continue their change. Participants were asked if they had completed their weekly homework; if they had not done so, the reason was asked and the participants were encouraged to continue for a few more extra days. In order to proceed from one module to the next module, completion of the previous module was required.

Measurements

The questionnaire used in this study included 10 sections. (1) Socio-demographic data. (2) The NORC SDM Screen for Gambling Problems (NODS) (Gerstein, Hoffman, Larson *et al*., 1999). The sums of 17 NODS-items were computed: maximum was 10 points (0 point = no gambling problem; 1–2 points = risky gambling habits; 3–4 = problem gambling; 5–10 points = PG. NODS scores were categorized as follows 1–4 points for non-PG and 5 and 5> for PG. (NODS scores of past two months were used in analyses). (3) The nine main gambling types were: slot machines (Finland's Slot Machine Association RAY), betting games both on paper and via Internet (Finnish National betting agency Veikkaus), on-track horse racing (Finnish horse race betting agency Fintoto), Internet poker via International websites, Internet poker via Finnish websites (RAY), other internet games, gambling in the casino, any other type of gambling, and other Internet games that are not gambling. (4) Four questions of wagering: money wagered to gambling per week over the past month and year; money wagered during each gambling session over the past month and year. (5) The patient-administered version of the MADRS-S, (Montgomery and Asberg, 1979). (6) The 3-item Alcohol Use Identification Test AUDIT-C. (7) Questions about social consequences (5-point Likert-scale, where 1 = very negatively to 5 = very positively). Cronbach alpha for mean score was 0.89. (8) One question of impaired-control (5-point Likert-scale, where 1 = never to 5 = always): Have you sometimes lost control of the time while you gamble? (9) One question about gambling urge (10-point Likert-scale): How strong is your gambling urge, when is it at its strongest? (10-point Likert-scale where 1 = weak gambling urge to 10 = strong gambling urge). (10) Fourteen questions about gambling related thoughts (yes/no-answers). Cronbach alpha for sum score was 0.69. Therapists were interviewed to hear feedback from the participants.

Statistical analysis

Gender differences in socio-demographic variables (age, age at the onset of gambling) and gambling types were analyzed using *t*-tests and Chi square tests, respectively. Regression modeling was used to study the changes in time in the variables of interest. NODS, gambling urge and impaired control of gambling were dichotomized and analyzed using logistic regression. That is, three dummy variables were created where the cut offs were five or more for NODS, six or more for gambling urge

and three or more for impaired control. Other outcomes were analyzed as continuous variables using linear regression. Explanatory variables in the models were time, gender and age at the onset of gambling. Generalized estimating equations (GEE; Liang & Zeger, 1986) were used in the estimation. This type of analysis takes into account the fact that there are measurements from more than one time point.

RESULTS

The mean age of the participants was 34.5 years (SD = 11.8). The mean age at the onset of gambling was 23.3 years (SD = 12.2). Males (M = 20.1, SD = 9.55) started gambling significantly earlier than females (M = 30.6, SD = 14.38, t = −9.344, df = 462, p = 0.001). With respect to the highest attained educational level, 41.6% of the participants had completed high school, 15.5% had a bachelor's degree, 14.4% a middle school education, 12.1% a vocational college degree, 11.9% a masters or higher level university degree, and 3.1% of the participants had an elementary school education. With regards to employment, 64.9% of the participants were employed and working full time, 9.8% were unemployed, 8.6% were students, and 1.9% were retired, while the remainder were either on early retirement, on long-term sick leave, as housewife/househusband, on parental leave, or reported their employment status as other. Of those participants who started the PP-program, 224 completed the 8-weeks program. Thus the retention rate was 48%. The 6-month follow-up showed a 16.2% retention rate and the 12-month follow-up an 8.8% retention rate.

Gambling related problems: NODS

The results from the NODS analyses showed that there was a significant reduction in gambling-related problems from baseline to post-intervention phase. Probability of having a NODS score of 5 or more had decreased after the treatment period (OR = 0.041, p < 0.001) indicating that risk of PG decreased. Onset age for gambling and gender were not significantly associated with NODS score (Table 1).

Gambling urge

Urge to gamble decreased significantly from baseline to post treatment phase (OR = 0.036, p < 0.001), and continued to decrease significantly until the 6 months follow up (OR = 0.53, p < 0.05). There were no gender specific differences with gambling urge or association between gambling urge and the onset age of gambling (Table 1).

Impaired control of gambling

Impaired control of gambling improved significantly from baseline to the post treatment phase (OR = 0.088, p < 0.001), indicating that the participants felt more in control over their gambling after the treatment (Table 1).

AUDIT-C

Participants' consumption of alcohol decreased significantly from baseline to the post treatment phase (B = −0.66, p < 0.001). In alcohol consumption, a significant gender specific difference was found: females consumed significantly less alcohol than males (B = −1.32, p <0.001). Onset age of gambling was significantly related to the frequency of alcohol consumption (B = −0.032, p < 0.001): those who had started gambling earlier, consumed more alcohol than those who had started gambling later (Table 2).

Social consequences

Our results revealed that gambling-related social consequences significantly decreased after the treatment period (B = −0.25, p < 0.001), and continued to decrease until the 6 month follow up (B = −0.63, p < 0.001). It was also found that females reported less social consequences due the gambling than males (Table 2).

Gambling-related erroneous thoughts

Gambling-related erroneous thoughts declined significantly from baseline to the post treatment phase (B = −1.96, p < 0.001). Also, gambling related erroneous thoughts were significantly associated with onset age (B = −0.04, p < 0.001). This indicates that those who started gambling earlier had more gambling related erroneous thoughts (Table 2).

MARDS-S

Separate MARDS-S analyses showed significant difference from baseline to the post treatment phase in MARDS-S scores (B = −7.80, p < 0.001), indicating a decrease in depressive feelings after the treatment (Table 2).

Table 1. *Logistic regression table: odds ratios and confidence intervals for gambling related problems (NODS), gambling urge and impaired control of gambling*

	NODS		Gambling urge		Impaired control	
Variable	OR	95% CI	OR	95% CI	OR	95% CI
Baseline - Post treatment	0.041***	0.024–0.067	0.036***	0.018–0.069	0.088***	0.049– 0.157
Post treatment - 6 months	0.69	0.22–2.15	0.53*	0.31–0.90	0.96	0.30–3.08
Female	1.09	0.70–1.68	1.13	0.65–1.70	1.31	0.87–1.99
Onset Age	1.00	0.98–1.01	0.99	0.97–1.01	1.00	0.98–1.01

Notes: OR = odds ratio, CI = confidence interval.
***p < 0.001. Cut offs in the outcomes were: > 4 for NODS score (PG), > 5 for Gambling urge and > 2 for Impaired control. Generalized estimating equations (GEE) were used to estimate the regression parameters.

Table 2. *Linear regression table: Estimates and confidence intervals for alcohol consumption (AUDIT), social consequences, gambling-related erroneous thoughts and depression (MARDS-S)*

	AUDIT-C		Social consequences		Erroneous thoughts		MARDS	
Variable	B	sd	B	sd	B	sd	B	sd
Baseline - Post treatment	−0.66***	0.13	−0.25***	0.05	−1.96***	0.19	−7.8***	0.53
Post treatment - 6 months	−0.33	0.32	−0.63***	0.11	0.48	0.3	−0.34	1.09
Female	−1.32***	0.25	0.07	0.07	0.06	0.25	0.95	0.80
Onset Age	−0.032***	0.009	−0.002	0.002	−0.038***	0.01	−0.013	0.03

Notes: CI= confidence interval.
***$p < 0.001$. Generalized estimating equations (GEE) were used to estimate the regression parameters.

GAMBLING TYPES

The most popular games were slot machines (57%), with males gambling significantly more slots than females ($\chi^2 = 13.480$, $df = 1$, $p < 0.001$); second favorites were betting games and lotto by Veikkaus (34.3%), with males playing betting games and lotto significantly more often than females ($\chi^2 = 7.180$, $df = 1$, $p < 0.01$); the third favorite was miscellaneous internet games (30.1%), which showed no significant gender difference. The other reported games were RAY internet poker (19.7%), with males gambling significantly more often than females ($\chi^2 = 20.429$, $df = 1$, $p < 0.001$), gambling in a casino (11.3%), miscellaneous games (14.4%), Internet poker via international websites (5.6%), and on-track horse betting (4.2%). Most of the participants reported playing more than one type of game.

Wagers

A significant decrease in wagering was observed as a result of completing the program. Results indicated that participants' monetary losses reduced significantly after the treatment: participants wagered each week on the average EUR 133.73 less, t (153) = 4.08, $p < 0.001$. A similar trend was seen in the amounts wagered per gambling session and per month after the treatment: expenditure for both decreased.

Feedback from the participants

"This program saved my life, thank you;" " It was hard to get committed to the program and complete the modules at the beginning. Therapist's encouragement help me to continue, thank you;" "Once, I got used to therapist's calls, I started waiting for those conversations;" "Modules were easy to understand;" "Involving significant others, was challenging, but helpful."

DISCUSSION

The aim of this analysis was to explore the impact of the PP-program while sharing experiences from the field, namely: how the program worked in practice.

Impact of the program

An analysis of the PP-program indicated that the program significantly reduced gambling-related problems, gambling urge, and impaired control of gambling. It was also recognized that participants' mood and handle over social situations improved along with a decrease in alcohol consumption following treatment. Our findings are in line with the results of (Carlbring *et al.*, 2012; Degerman, 2010) who found a reduction in pathological gambling, anxiety, depression, and improvement in quality of life with program implementation and 6, 12, and 36 month follow ups.

The PP-program is based on a cognitive behavioral (CBT) approach. The ingredients of the PP-program are motivational enhancement, recognition of gambling behavior, erroneous thoughts and reflection of consequences (social, economic and psychological), and relapse prevention. Measures from baseline to post treatment indicated that participants' gambling activities declined. The element of motivational enhancement (Miller, 1983) was effective by keeping participants engaged in their process of change. The PP-program addressed gambling related erroneous thoughts such as illusion of control, misperception of randomness and independence of events that have been shown to be factors that increase gambling (Hill & Williams, 1998; Langer, 1975; Ladouceur, 2004; Toneatto, Bliz-Miller, Calderwood, Dragonetti, Tsanos 1997; Toneatto & Ladouceur 2003) as well as impaired control (IC), which is a central component of the construct of addiction (Gossop, Darke, Griffiths *et al.*, 2006) and dependence (Martins, Tavares, da Silva Lobo, Galetti & Gentil, 2006). IC indicates that "the individual is chronically and progressively unable to resist impulses to gamble (Diagnostic and Statistical Manual of Mental Disorders (American Psychiatric Association, 1980, p. 292). Cantinotti, Ladouceur and Jaques (2009) stated that gambling related erroneous thoughts which relate to positive expectations of success may in fact influence PGs erroneous perceptions. This could in turn contribute to feeling less in control in a gambling situation, potentially leading to a vicious cycle of gambling. According to our results, the PP-program reduced participants' erroneous thoughts and urge to gamble while increasing IC. A noteworthy finding of this study was that early onset age for gambling seemed to be associated with both higher amount of erroneous thoughts and higher level of alcohol consumption. Alvarez-Moya, Jimenez-Murcia, Aymami *et al.* (2011) reported similarly that the early onset age was associated with PG.

The participants that completed the PP-program reported a decrease in negative social consequences. Individuals with gambling problems often experience a range of detrimental social consequences (Roy, Custer, Lorenz & Linolla 1988) including; marital problems, domestic violence, behavioral problems among children, verbal and physical abuse, suicide attempts as well as

financial issues (Roy *et al.* 1988). Ladouceur (1993) noted that for each PG, there are at least ten people affected by the negative consequences of gambling. Results imply that the PP-program improved participants' awareness around gambling related consequences as well as their self-efficacy, by encouraging participants to take more charge of their everyday activities, planning and to observe the consequences of their own choices, which could in turn lead to less gambling. Additionally, Carlbring *et al.* (2012) stated that social support has a positive influence for gamblers recovery. The PP-program includes significant others to the treatment and based on a few qualitative comments from the participants, they have found that being helpful.

Pathological gambling is often co-occurring with substance use disorders as well as with mood, anxiety, and personality disorders (Petry, 2005a). Hakkarainen, Järvinen-Tassopoulos and Metso (2008) for instance, reported a correlation between intentional binge drinking and increased alcohol consumption with gambling activity. Depression as a comorbidity with gambling (Cunningham-Williams, Cottler, Compton & Spitznagel, 1998; Gerstein *et al*., 1999; Marshall & Wynne, 2004; Petry, Stinson & Grant, 2005: Kessler, Hwang, LaBrie *et al*. 2008; Park, Cho, Jeon *et al*., 2010; The Productivity Commission, 2010) was observed within our sample as well. Our analysis showed that participants' alcohol consumption decreased and mood improved after the program.

Practical points

The PP-program is the first CBT therapy as well as the first Internet-based therapy offered to gamblers in Finland. As the main purpose of implementing the program was practical, systematic data collection was not carefully followed up throughout the time period. Retention rates of the program were relatively low, especially with 6 months and 12 month follow up phases. PP-program's retention rate was 48%, which is in line with other treatment studies as dropout rates from pathological gambling studies range from 43% to 80% (Blanco, Petkova, Ibanez & Seiz-Ruiz, 2002; Ladouceur *et al*., 2001; Sylvain *et al.*, 1997). Additionally, one explanation for drop- outs could be natural recovery that often occurs among gamblers (Petry, 2005b; Slutske, 2006). Yet, both 6 month and 12 month follow up dropout was higher than usual and a limiting factor in this study, especially when intending to measure treatment efficacy in a longer term. Based on interviews with PP-program therapists, follow up emails and phone calls had taken place as planned, yet the completion of the Internet-questionnaires was not monitored nor recorded systematically. The official dropout rate of the PP-program from the data collection period was 20% (based on phone call follow ups only). The client feedback was collected via phone calls revealing that the participants were satisfied with the program and the telephone conversations with the therapists. Nevertheless, bearing these practical points in mind, there are several limitations with this study, especially compared to Carlbring *et al*.'s (2012) recent analysis of a similar 8-week Internet-based cognitive behavioral therapy with even shorter phone calls (15 minutes). Limitations of this study are low response rate in both follow up periods and lack of comparison group.

Conclusion and Suggestions

As has been recognized by a review on the effectiveness of Internet-based therapy for addictions (Gainsbury & Blaszczynski, 2011b), the extensive availability of the Internet provides an ideal opportunity for wide-ranging dissemination and improved access to interventions (Copeland & Martin, 2004; Cunningham, 2005). As a treatment medium, the Internet has an enormous potential to serve as an effective therapeutic tool for individuals who seek help for addictions. The major finding of this study was that the offered program was successful as a specialized, low-threshold treatment service for problem gamblers. This finding is in line with Pitkanen and Huotari (2009) preliminary findings of the PP-program. This analysis brings experience from the practical point of view with promising findings of the Internet as an option for a therapy medium. Our findings are supported by clinically sound study of Carlbring *et al*. (2012). As the PP-program significantly reduced gambling and improved the participants' quality of life, the program should be continued in Finland and hopes to offer alternatives to other countries as well. Countries, in a similar situation than Finland, where treatment options for gamblers are still limited. Although Internet-based treatment is flexible and easily accessible from home, it is important to pay careful attention to the high percentage of discontinuation of treatment and closely monitor follow up procedures in order to confirm how the gains in treatment hold. As well as, to continue investigating to whom Internet-based treatment is best suited for, as discussed more in depth in Carlbring *et al*. (2012). As a result of the study, PP-program's follow up data collection-systems have already been modified.

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REFERENCES

Alvarez-Moya, E., Jimenez-Murcia, S., Aymami, M. N., Gomez-Pena, M., Granero, R., Santamaria, J., Menchon, J. M., Fernandez-Aranda, F. (2010). Subtyping study of pathological gamblers sample. *The Canadian Journal of Psychiatry*, *8*, 498–506.

American Psychiatric Association. (1980). Diagnostic and statistical manual of mental disorders (4th edn., text rev.). Washington, DC: APA.

Barak, A. Hen, L., Boniel-Nissim, M. & Shapira, N. (2008). A comprehensive review and meta-analysis of the effectiveness of Internet based psychotherapeutic interventions. *Journal of Technology in Human Services*, *26*, 109–160.

Bennett, G. C. & Glasgov, R. E. (2009). The delivery of public health interventions via Internet: Actualizing their potential. *Annual Review of Public Health*, *30*, 273–292.

Bergstrom, M. & Lundgren, R. (2007). Utvärdering av internetbaserat självhelpsbehandling i combination med telefonstöd vid spelmani. (Unpublished Master's Thesis). Lindköping, Lindköpings Universitet.

Blanco, C., Petkova, E., Ibanez, A. & Seiz-Ruiz, J. (2002). A pilot placebo-controlled study of fluvoxamine for pathological gambling. *Annals of Clinical Psychiatry*, *14*, 9–15.

Cantinotti, M. Ladouceur, R. & Jaques, C. (2009). Lay and scientific conceptualizations of impaired control at electronic gambling machines. *Addiction Research*, *17*, 650–667.

Carlbring, P., Degerman, N., Jonsson, J. & Andersson, G. (2012). Internet-based treatment of pathological gambling with a three-year follow-up. *Cognitive Behaviour Therapy*, *41*, 1–14.

Carlbring, P. & Smit, F. (2008). Randomized trial of Internet- delivered self-help with telephone support for pathological gamblers. *Journal of Consulting and Clinical Psychology*, *6*, 1090–1094.

Copeland, J. & Martin, G. (2004). Web-based interventions for substance use disorders: A qualitative review. *Journal of Substance Abuse Treatments*, *26*, 109–116.

Cuijpers, P, van Straten, A. & Andersson, G. (2008). Internet administered cognitive behavior therapy for health problems: A systematic review. *Journal of Behavioral Medicine*, *31*, 169–177.

Cunningham, J.A. (2005). Little use of treartment among problem gamblers. *Psychiatric Services*, *56*, 1024–1025.

Cunningham, J.A. (2007). Internet-based interventions for alcohol, tobacco and other substances of abuse. In P. Miller & D. Kavanagh (Eds.), Translation of addictions science into practice (pp. 399–438). New York: Elsevier-Pergamon.

Cunningham-Williams, R. M., Cottler, L. B., Compton, W. M. & Spitznagel, E. L. (1998). Taking chances: Problem gamblers and mental health disorders results from St. Luis epidemiologic catchment area study. *American Journal of Public Health*, *88*, 1093–1096.

Degerman, N. (2010). Internet-delivered self-help with telephone support for pathological gamblers: An effectiveness-study of treatment as well as predictors of treatment outcomes, dropouts and relapse. Seminarwork, ISRN-number LIU-IBL/PY-D_10/278_SE, language Swedish.

Gainsbury, S. & Blaszczynski, A. (2011a). Online Self-guided Interventions for the Treatment of Problem Gambling. *International Gambling Studies*, *11*, 289–308.

Gainsbury, S. & Blaszczynski, A. (2011b). A systematic review of internet-based therapy for the treatment of addictions, *Clinical Psychology review*, *31*, 490–498.

Gerstein, D., Hoffmann, J., Larson, C., Engelman, L., Murphy, S., Palmer, A., Chuchro, L., Toce, M., Johnson, R., Buie, T. & Hill, M.A. (1999). Gambling impact and behavior study, (Report to The National Gambling Impact Study Commission). Chicago, National Opinion Research Center at the University of Chicago.

Gossop, M., Darke, S., Griffiths, M., Hando, J., Powio, B., Hall, W. & Starng, J. (2006). The Severity of Dependence Scale (SDS): psychometric properties of the SDS in English and Australian samples of heroin, cocaine and amphetamine users. *Addiction*, *90*, 607–614.

Grant, J. E. & Potenza, M. (2007). Treatments for pathological gambling and other impulse control disorders. In P. E. Nathan & J. M. Gorman (Eds.), A guide to treatments that work (3rd ed., pp. 561–577). New York: Oxford University Press.

Hakkarainen, P., Järvinen-Tassopoulos, J. & Metso, L. (2010). Miten alkoholinkäyttö, rahapelaaminen ja huumeidenkäyttö kytkeytyvät toisiinsa? In P. Mäkelä, H. Mustonen & C. Tigerstedt (Eds.), Suomi juo suomalaisten alkoholinkäyttö ja sen muutokset 1968–2008 (pp. 264–279). Helsinki: National Institute for Health and Welfare.

Hill, E. & Williams, S. (1998). Choose six numbers, any six numbers. *The Psychologist*, *1*, 7–20.

Kessler, R., Hwang, I., LaBrie, R., Petukhova, M., Sampson, N. A., Winters, K. C. & Shaffer, H. J. (2008). The prevalence and correlates of DSM-IV Pathological Gambling in the National Comorbidity Survey Replication. *Psychological Medicine*., *38*, 1351–1360.

Ladouceur, R. (1993). Jeu pathologique (Pathological gambling). In R. Ladouceur, O. Fontaine & J. Cottraux (Eds.), Therapie cognitive et complementale (pp. 123–128). Paris: Mason.

Ladouceur, R. (2004). Gambling the hidden addiction. *The Canadian Journal of Psychiatry*, *49*, 501–503.

Ladouceur, R., Sylvain, C., Boutin, C., Lachance, S., Doucet, C., Leblond, J. & Jaques, C. (2001). Cognitive treatment of pathological gambling. *Journal of Nervous and Mental Disease*, *189*, 774–780.

Langer, E. (1975). The Illusion of Control. *Journal of Personality and Social Psychology*, *32*, 311–328.

Liang, K. Y. & Zeger, S. L. (1986). Longitudinal data analysis using generalized linear models. *Biometrika*, *73*, 13–22.

Marshall, K. & Wynne, H. (2004). Fighting the odds. Perspectives. *Statistics Canada*, *11*, 7–15.

Martins, S. S., Tavares, H., da Silva Lobo, D. S., Galetti, A. M. & Gentil, V. (2004). Pathological gambling gender, and risk-taking behavior. *Addictive Behavior*, *29*, 1231–1235.

Miller, W. R. (1983). Motivational interviewing with problem drinkers. *Behavioural Psychotherapy*, *11*, 147–172.

Montgomery, S.A. & Asberg, M. (1979). A new depression scale designed to be sensitive to change. *The British Journal of Psychiatry*, *134*, 382–9.

Park, S., Cho, M.J., Jeon, H.J., Lee, H.W., Bae, J.N., Park, J.I., Sohn, J.H., Lee, Y.R., Lee, J.Y. & Hong, J.P. (2010). Prevalence, clinical co-relations, co-morbidities and suicidal tendencies in pathological Korean gamblers: Result from a Korean epidemiological catchment Area Study. *Social Psychiatry and Psychiatric Epidemiology*, *45*, 621–629.

Petry, N. (2005a). Comorbidity of disordered gambling and other psychiatric disorders. In: Petry N, (Ed.). Pathological Gambling: Etiology, Comorbidity and Treatment. Washington, DC: American Psychological Association.

Petry, N. (2005b). Stages of change in treatment seeking pathological gamblers. *Journal of Consulting and Clinical Psychology*, *73*, 312–322.

Petry, N. M., Stinson, F. S. & Grant, B. F. (2005). Comorbidity of DSM-IV pathological gambling and other psychiatric disorders: Results from the National Epidemiologic Survey on Alcohol and Related Conditions. *Journal of Clinical Psychiatry*, *66*, 564–574.

Pitkanen, S. & Huotari, K. (2009). "Pahimmasta on paasty". Arvionti Peli poikki- ohjelmasta pelaajan tukena. (We're over the worst". An evaluation of the Peli poikki programme). National Institute for Health and Welfare (THL), Report 20/2009, 1–126. Helsinki.

Productivity Commission (2010). Gambling: Final report. Canberra: Government of Australia.

PGRTC Problem Gambling Research and Treatment Centre (PGRTC) (2011). Guideline, assessment and treatment in problem gambling. Monash University: Clayton.

Roy, A., Custer, R, Lorenz, V. & Linolla, M. (1988). Depressed pathological gamblers. *Acta Psychiatrica Scandinavica.*, *77*, 163–165.

Slutske, W. S. (2006). Natural recovery and treatment seeking in pathological gambling. Results of two U.S. National Surveys. *American Journal of Psychiatry*, *163*, 297–302.

Sylvain, C., Ladouceur, R. & Boisvert, J.-M. (1997). Cognitive and behavioral treatment of pathological gambling: a controlled study. *Journal of Consulting and Clinical Psychology*, *65*, 727–732.

Toneatto, T., Bliz-Miller, T, Calderwwod, K., Dragonetti, R. & Tsanos, A. (1997). Cognitive distortions in heavy gambling. *Journal of Gambling Studies*, *33*, 253–266.

Toneatto, T. & Ladouceur, R. (2003). Treatment of pathological gambling : A critical review of the literature, *Psychology of Addictive Behaviors*, *17*, 284–292.

Turja, T., Halme, J., Mervola, M., Järvinen-Tassopoulos, J. & Ronkainen, J-E. (2012). Suomalaisten rahapelaaminen 2011 (Finnish gambling 2011). National Institute for Health and Welfare (THL). Report 14/2012. Helsinki.

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